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LONDON, SATURDAY, APRIL 24, 1880.

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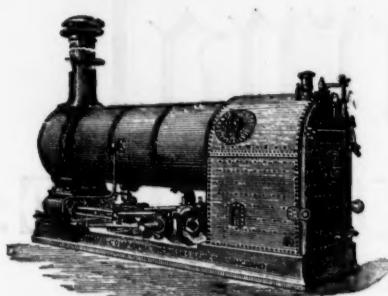
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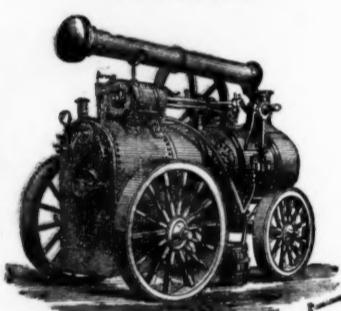
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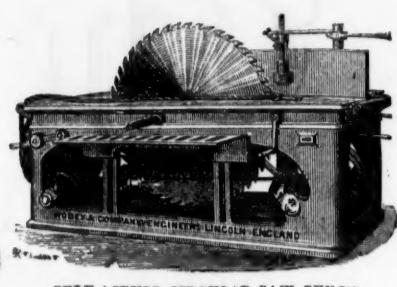
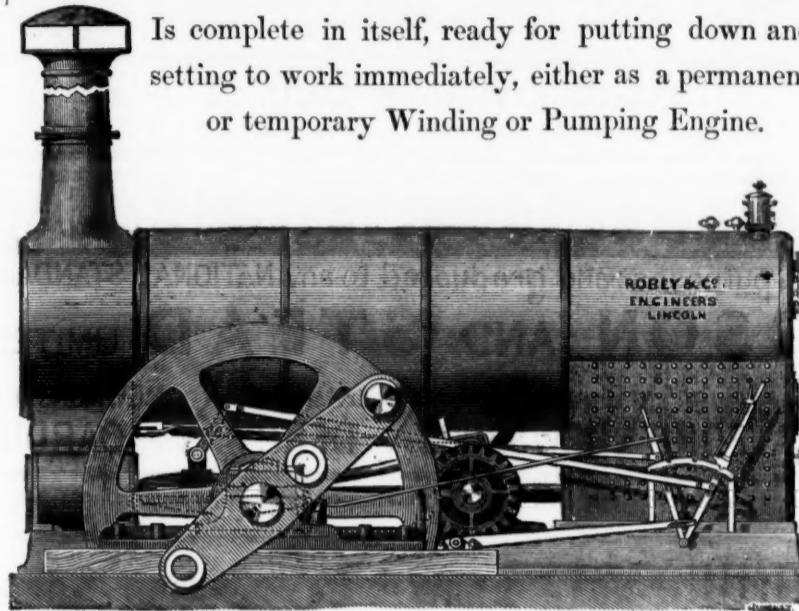
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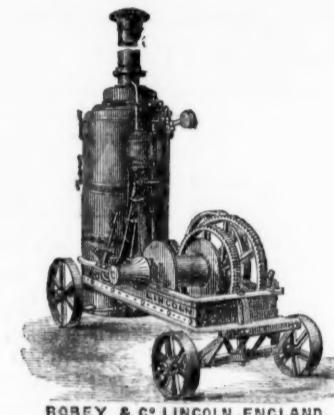
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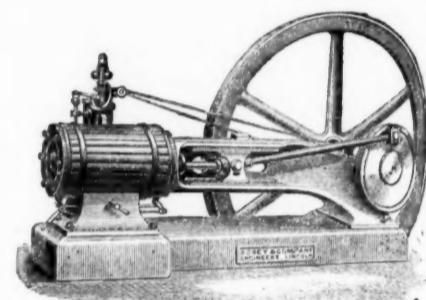
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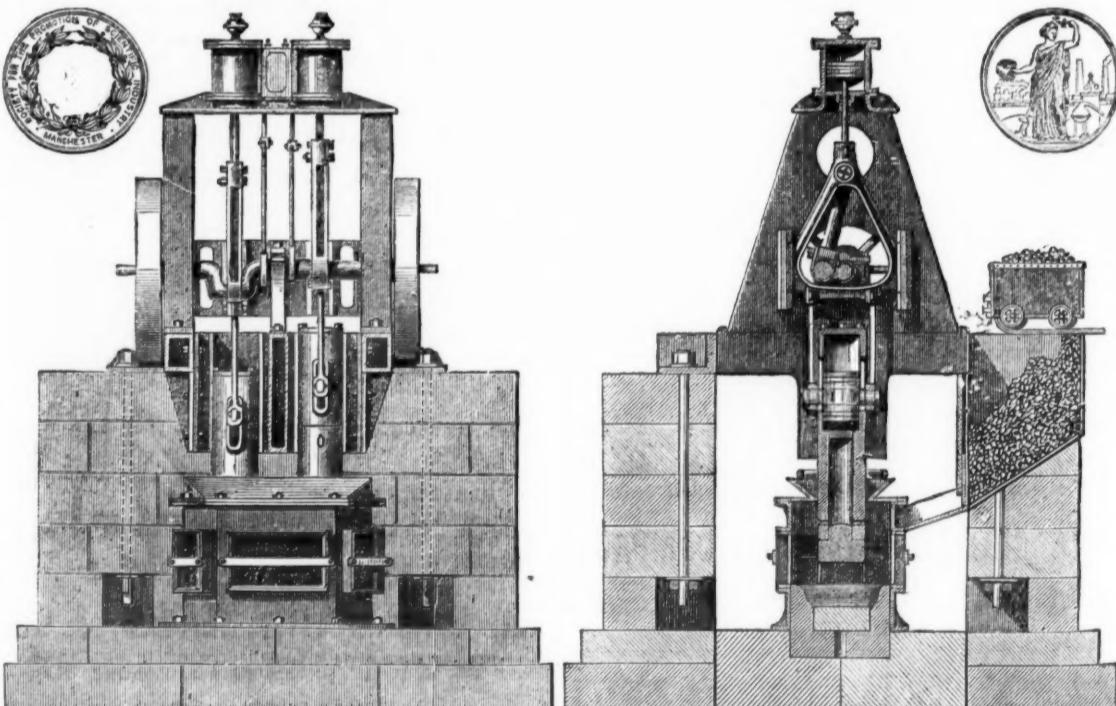
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Original Correspondence.

ON BOILER EXPLOSIONS.

SIR.—The frequency of steam-boiler explosions, with the terrible results which follow them, is still a subject requiring investigation, for the prevention of which no adequate remedy has as yet been devised. The explosion of a boiler at the St. Rollox works of the Glasgow Iron Company, in March 5 last, may be mentioned as an instance of the destruction to life and property they occasion, no less than 24 workmen having either been killed instantaneously or succumbed afterwards to the dreadful injuries inflicted by this explosion. The boiler explosion at North Seaton Colliery on the 7th inst., causing the death of one person—the fireman—furnishes another instance of the inscrutable nature of some of these occurrences. All the efforts of the engineers and others who were examined at the Coroner's inquest proved futile in solving the mystery. A practical man of 30 years' experience said—"With all their science, they have not been able to find out the causes which lead to boiler explosions." This remark, however, is correct only in a few instances. The investigations of the boiler inspection companies, instituted of late years for the purpose of preventing these accidents, go to prove that in the main they are not uncontrollable accidents, but that they may for the most part be avoided by competent periodical inspection. The results obtained by a combination of insurance with inspection are stated by those competent to give an opinion on the subject to be preferable to inspection alone; others, again, advocate independent inspection alone. But the number of boilers insured and inspected greatly exceeds the number where inspection alone is in operation. The rate of explosion amongst insured and inspected boilers is stated to be about 1 in 9500. The questions relating to the safe working of steam boilers are now being to some extent solved by proper examination and accurate information of their condition at the time when explosion occurs. The safety of boilers is to some extent dependent on the owners, for unless opportunities for thorough examination by an inspector are afforded neither insurance nor inspection as a system can give a guarantee that accidents will not happen. During the year 1879 it is stated that three of the explosions have happened where the boilers were inspected and insured, but in one of those cases a thorough examination of the boiler had not been made for upwards of four years, owing to the owners not giving the requisite facilities for the inspector to examine it. Periods of one year are quite long enough between thorough examinations, and where preparations are not made to enable an inspector to make a complete examination the responsibility of the insurance company should be withdrawn.

The following is a list of boiler inspection companies and the number of boilers insured and inspected. The first on the list undertakes inspection only of boilers and engines; the others work on the insurance and inspection principle:—

	Boilers Inspected.
Manchester Steam Users Association.....	3,500
Boiler Insurance and Steam-power Company	23,000
" National Boiler Insurance Company.....	7,200
Wolverhampton } Midland Inspection and Assurance.....	3,218
Yorkshire Company	" 2,000
Mutual	" 1,000
London Mutual	" 1,000
Newcastle	" 114
Manchester Engine and Boiler Insurance.....	500
English and Scotch	—
Total.....	41,532

Subjoined is a list of boiler explosions, as reported by the Midland Company, for 18 years since 1862:—

Year.	Number of Explosions.	Number Killed.	Number Injured.	Year.	Number of Explosions.	Number Killed.	Number Injured.
1862	36	91	69	1871	66	66	113
1863	50	80	78	1872	74	50	137
1864	49	76	113	1873	88	66	94
1865	58	50	92	1874	76	77	198
1866	70	85	160	1875	68	81	142
1867	48	70	88	1876	39	95	110
1868	45	57	71	1877	44	54	75
1869	59	87	128	1878	46	47	84
1870	70	85	133	1879	30	38	53

Average in 18 years—56 explosions, 69 killed, 108 injured.

During this period, according to the record, the greatest number of explosions occurred in the three years 1872-3-4—a period of great activity in the iron and coal trades—the average number of explosions being 79, and of deaths resulting 64, besides 143 injured. But the largest number of persons killed by explosions occurred in 1876, by the rending of 39 boilers, with a loss of 93 lives, and injuries to 110 persons. It is satisfactory to be able to report that the deaths and injuries in 1879 were reduced greatly below the average, and below those of any previous year; at the same time, it is probable that the number of boilers in use is every year on the increase.

It should be observed that the records of the different companies differ considerably in the number of explosions for the year 1879, and the deaths and injuries to persons resulting from them. Following the Midland Company's statement for last year, the boilers which exploded were used in different works as follows:—

Boilers.	Number of explosions.	Number Killed.	Number Injured.
Marine.....	4	6	0
Ironworks	6	15	11
Various mills	3	9	21
Collieries	3	3	5
Railways	3	1	6
Farming	2	2	1
Saw-mill	2	0	1
Mineral water.....	1	0	1
Hay and straw	2	0	2
Canal boat	1	2	0
Chemical	1	0	3
Hoisting on ships	1	0	2
Cabinet works	1	0	0
Total	30	38	53

Besides these 17 accidents occurred, resulting in the loss of 6 lives and injuries to 35 persons, originating from the explosion of kitchen and rag boilers, and from the bursting of locomotive tubes or parts of multitubular boilers. The causes of boiler explosions, as given in the above tabular form, may be classed as follows:—

1.—Defective construction or repairing; might be prevented by inspection previous to starting a boiler or after repairing it.

2.—Corrosion, internal or external; only to be detected by official inspection.

3.—Faults from inattention or carelessness of attendants, as want of water, over pressure of steam, &c.

The greatest number of deaths and injuries in 1879 happened with Cornish and Lancashire boilers, the plain cylinder boiler following next with nearly equal numbers. None of the boilers which exploded in 1879 were under the care of the Midland Company. The records confirm the opinion often expressed that inspection by independent officers is the best preventive of explosion. Of the 30 boiler explosions which happened in 1879 the greatest fatality resulted from those used in ironworks. The following particulars are given of boilers generally in connection with the principal explosions:—

Explosion on Jan. 30, two deaths, three injuries; plain cylinder boiler, 25 ft. long by 4 ft. diameter, 7-16 in. plates, 35 lbs. pressure. This was torn into three pieces; the first rupture arising from some irregular-shaped patches at the bottom over the fire, the rivet-holes being strained and cracked. The cold feed entered above the fire, causing a deposit of scale in the hottest place, necessitating frequent repairs at this part, which led to the rupture.

Explosion on Feb. 27, two injured; plain cylinder with flat ends, 6 ft. long, 2 ft. 4 in. diameter, 3-16 in. plates, pressure 45 lbs. The shell was rent from end to end, and opened out flat. The plates were reduced to $\frac{1}{4}$ in. thick, where they rested on the brickwork to 1-16 in.

Explosion on March 1, two deaths, thirteen injured; Lancashire

boiler, 23 $\frac{1}{2}$ ft. by 6 ft. diameter, $\frac{3}{8}$ in. plates, tubes 2 ft. 4 in. diameter, pressure 50 lbs.—16 years in use. The shell rent from end to end along the line of fittings, and flattened out on its seat. The safety-valves had been removed from this and two adjoining boilers, fires being kept on, the boiler burst from over-pressure.

Explosion May 13, five deaths and one injured; plain cylinder boiler, 30 ft. by $\frac{5}{8}$ ft. diameter, $\frac{1}{4}$ in. plates, pressure 60 lbs.—three years in use. This boiler had been repaired in the plates over the fire several times; this arose from the bad quality of the iron, and from the strain it was subject to owing to the cold feed entering above the fire. The repairs had been executed badly, the rivet-holes being askew caused the plates to crack. The boiler burst at these repaired seams.

Explosion June 16, one death, six injured; Lancashire boiler, 34 ft. by 7 ft. diameter, 7-16 in. plates; tubes 2 ft. 8 in. diameter, 7-16 in. plates, pressure 50 lbs.—26 years in use. Both tubes collapsed and rent at several of the ring seams. The shell was broken in many pieces and scattered. The cause of this accident was said to be over-heating of the tubes from short supply of water.

Explosion Aug. 6, two injured; plain cylinder boiler, 8 $\frac{1}{2}$ ft. by 2 ft. 9 in. diameter, $\frac{1}{4}$ in. plates, ends $\frac{3}{8}$ in., pressure 24 lbs. This vessel ruptured near the bottom, where it touched the brickwork, and where it was reduced by external corrosion to 1-32 in. in some places. The rent extended from end to end of the shell, opening out flat.

Explosion Aug. 16, no injury; locomotive, 31 years old, 10 $\frac{1}{2}$ ft. by 3 ft. 10 in. diameter, 7-16 in. plates, pressure 120 lbs. There were three rings of plates, boiler gave way at the first ring seam, where the plates were reduced by internal corrosion to $\frac{1}{4}$ in. and to $\frac{1}{8}$ in. thick in some places.

Explosion Sept. 9, two deaths; vertical boiler, with internal grate, annular smoke box, 7 ft. in height, 4 ft. 4 in. diameter, pressure 70 lbs. This had lately undergone repairs, had been tested by hydraulic pressure, and was being further tested by steam, when it ruptured from excessive pressure; the outer shell torn into several pieces, and scattered to a great distance.

Explosion Oct. 9, six deaths, two injured. Return-tube boiler, one of four, 30 ft. by 7 ft. diameter 7-16 in. plates, tube 2 ft. 9 in. diameter. The lower half of the front end was blown out. The six stays, which should have secured the lower half of the front plate, were useless, owing to the rivets having broke, and to rivets not having been put in. The expansion and contraction of the shell and tube caused fracture in two of the stays; in another stay the rivets had worn away until they dropped out. This boiler, though insured, had not been examined internally for four years; had it been thoroughly examined the wear and tear would have been detected, and the explosion in all probability prevented.

These are a few cases of boiler explosion given to show the advantages of inspection by experienced officers, whose time being almost entirely devoted to internal and external examinations are best able to detect defects and latent dangers associated with the use of boilers, defects which would probably remain undiscovered if left to the care and examinations of ordinary engine attendants. M. E.

OLD MEXICAN BONDS.

SIR.—The Mexican Bonds of the old issue of 1851 have been a good deal lately before the public, owing to the efforts of the bondholders' committee to induce the Mexican Government to act honourably towards the holders of these bonds. Rumours have lately been spread that the Mexican Government turns a deaf ear to the blandishments of the committee, but these rumours are incorrect, and the committee have, I understand, great hopes that the Congress now sitting will obtain reasonable terms, and that the holders of the 100*l.* bonds, with about 30*l.* worth of overdue coupons, may receive at least half their value. As these bonds can still be purchased at about 11*l.* each, there is ample margin for the bondholders realising very fairly on these securities. Let Mexico follow the example of Egypt, and pay her debts. Unfortunately, the Government of Mexico, in place of making a fair settlement of the question a few weeks ago, when a certain railway concession afforded the opportunity, failed to do so, and gave the railway business to a Mexican, but as this line of conduct entirely circumscribes their borrowing power on European exchanges, the well-directed efforts of the English committee will, doubtless, soon bring matters to a satisfactory conclusion.

LOOKER-ON.

THE FLAGSTAFF SILVER MINING COMPANY.

SIR.—From time to time many communications have appeared in the Journal in reference to the Flagstaff Company, and some censure has been passed on the directors for not calling the shareholders together. I believe if the shareholders will show a little more patience they will be rewarded, and handsomely too. The arrangements for re-working the mine are nearly completed, and it is my humble opinion that ere long the Flagstaff Company will be in possession of the next best American mine after the Richmond known on the London Stock Exchange. Friends of mine in Utah say they know the property well, and consider that under good management it could be made to produce a profit of from 35,000*l.* to 45,000*l.* yearly. I trust my brother-shareholders will not part with their holdings at the present price; and I venture to predict that before another two months they will rise to a far greater value. A SHAREHOLDER.

April 20.

RUBY AND DUNDERBERG MINING COMPANY.

SIR.—I can amply confirm all that your correspondent "For One and All" writes with regard to the attempted "rig" which a certain number of speculators has attempted in the shares of this company, without, I am glad to say, the slightest modicum of success. It is strange that the medium through whom these reports are spread should within a fortnight's time report that this mine is a real "bonanza" *au contraire*, it was to all intents and purposes "potted out." The statements are so contradictory that they bear their falsehood on the face. I am astonished that so astute a body as the mining dealers on the Stock Exchange, and those outside should pay any attention whatever to the parties who circulate these reports for their own ends.—April 22. — AN OLD SHAREHOLDER.

RUBY AND DUNDERBERG MINING COMPANY.

SIR.—You were good enough to insert last week a letter which I addressed to you respecting the attempts that were being made to depreciate the above property by circulating false reports of an unfavourable nature. If you will allow me, I should like to say a word or two more on the subject. The Ruby Mine is just in that stage of progress when the well-known game of the "bear" can be played with advantage. A few more months, and in all probability the Ruby will be as well known and well trusted as (say) the Richmond is now. But at present the Ruby is a young non-divisional paying mine, with its shares still at a discount, and the shareholders, especially country shareholders, far more sensitive to the influence of vague gloomy rumours, or of "bear"-made telegrams, than they will be when their mine is an established dividend-paying concern. It is greatly to be regretted that the public fall so easy a prey as they undoubtedly do to the "bears" of the Stock Exchange. They think that its price of the day is a faithful index of the intrinsic value of a share, whereas it is nothing of the sort. That which governs the price of the day or of the hour is the proportion of sellers to buyers in the mine market. If there are many sellers and few buyers prices fall, or *vice versa*. The really important thing to know is the nature of the buying or the selling—*i.e.*, whether it is *bona fide* and for *bona fide* reasons, or the work of "operators" or for gambling reasons. No one can ensure success in a mine investment. But everyone can deserve it by selecting only *bona fide*, well managed, and sound mines, such as a man of mining experience can recommend. The Ruby is such a mine, and no one knows this better than those whose temporary purpose is served by running it down. These operators do not care one straw what the real condition of a mine may be. What they care about is to make a gambling profit or avoid a gambling loss. It is thus that astute but unprincipled men frighten men of sound morality but no brains out of their shares. As regards Ruby shares I think if anyone

will take the trouble to enquire into the prospects of the mine he will, like myself, feel justified in looking confidently forward to that rapidly approaching time when the "bull" and the "bear" shall lie down together as investors in the peaceful enjoyment of a large and an increasing dividend.

"FOR ONE AND ALL."

RUBY AND DUNDERBERG MINING COMPANY.

SIR.—As various rumours, favourable and unfavourable, have recently been promulgated, with apparently the sole object of affecting this stock for speculative purposes, allow me, through your columns, to reply to numerous enquirers who have addressed me on the subject. I would simply say that each official report from the mine as it is received, whether by telegram or letter, is at once posted in the office and sent to you for publication. All telegrams are sent to the Stock Exchange.

As the management at Eureka has been specially requested to advise this office promptly of any important change, whether good or bad, I would warn the shareholders against accrediting any reports excepting those issued from this office or published under responsible auspices. At the request of numerous shareholders I yesterday wired to the management at Eureka to ascertain if there is any reason for the unfavourable reports current during the last few days, and have this day received a cablegram—"No reason."

London, April 23.

W. A. MALCOLM, Chairman.

BORING MACHINERY IN METALLIFEROUS MINES.

SIR.—Although much progress has been made during the recent revival of mining I think all will acknowledge that much more might have been done in the way of introducing rock-boring machinery, and that such introduction might have been made upon a principle which would have been equally beneficial to the miner and to the mine adventurer. I think one principal cause of this delay has been that the working miner has not been secured his full share of the advantage, so that although he may not have actually thrown obstacles in the way he has had no inducement to make machine mining a success. The question, then, is whether the miner can be given a share of the profit with advantage to the mine adventurer? One hears from tailors, bootmakers, saddlers, and other employers that whilst at first they declined to use sewing machines the workmen themselves obtained them, and at present earn more wages with them than they before got by hand, while the employers get the work better and more quickly done for less money. Why should not a similar state of things prevail in the case of mining, working miners, and rock drills? Let the miners have the full advantage of the machine and all will be benefited.

But, it will be asked, how can a miner earning 12*s.* 8*d.* per week, which is the average wages paid at Bwlch United, for example, or even 17*s.* or 18*s.* per week, as paid in Cornish mines, buy rock drills? It is, indeed, improbable that they would think of doing so, but the adventurers might provide them for them. The necessary air compressing machinery for 10 drills; a dozen drills, and all requisite connections for a moderately deep mine could be obtained for 150*l.*, and it should surely satisfy the shareholders if they obtain 5 per cent. for their money and a return of the outlay by the time the drills are paid for—say, three years. There would be 10 drills to hire out, and two in reserve, so that there need be no inconvenience to the workmen. The bargains should then be let at the same price as is now paid for hand labour, but for four months' or six months' stent, and the bargain takers should be allowed the privilege of hiring the drills at 1*l.* per month, the company keeping them in good working order, except in case of wilful damage. The miners would, of course, get the advantage of a good

downward tendency of the last month is evidently without any just cause. Some are now giving the smelters credit for keeping so small a margin at present between the buying and selling prices. There may be credit due to some; but has not a certain firm been all the time underselling the others, and so brought the reaction we have experienced? I am not a believer in more private companies for tin smelting, for there will only be more establishments to keep up after the old fashion. If the miner wishes to improve the sale of his produce there should be the miners' smelting-works. It is not enough to have the names of great mining men connected with smelting if they intend to undersell others, and bring down the price of metal thereby. The movement now on foot to get the tin sold by ticket is all moonshine, and no one ought to know it better than those making the attempt. The miner has much to encourage him at present, and would do well not to be frightened out of good holdings. We shall not have an increase in our production at home for some considerable time, and without calculating any further decrease from abroad all the tin will be required, and as consumption increases, as it is always doing, so in a little time we shall require an increase of supplies, and we have every reason to look forward to prosperous times in our home mining for many years to come—for as trade revives and new undertakings are opened up so will the metal trade expand to such an extent as is now impossible to conceive.—April 19. R. S. R.

mining properties, and the name of the working captain? I should like to know, as it may do good, and is certain not to do any harm.

EXTENDED MARKET FOR CHINA-CLAY.

SIR.—Although Portland cement, Roman cement, and the like have already been largely employed by paper-makers as a substitute for rags in the manufacture of brown and packing papers, the difficulty of obtaining china-clay, alum, and the like free from iron, which damages the colouring matters, has even prevented the most experienced paper-makers using more than 30 or 40 per cent. of mineral in white papers, the difficulty has, however, now been surmounted by a Philadelphia chemist—Mr. R. A. Fisher—who treats china-clay and the like so effectually that so far as colour is concerned the largest consumer of paper will be unable to distinguish china-clay from rags. The kaolin, bauxite, or other aluminium material is first to be treated with sulphuric acid according to any one of the usual methods for producing from these clays a solution of sulphate of alumina containing more or less iron. The solution of sulphate of alumina and iron is allowed to settle, and the clear liquor decanted into a lead-lined tank or other convenient vessel, where it is exposed to the action of a suitable reducing agent to convert any ferric oxide that may be present into ferrous oxide. Any powerful reducing agent may be employed. Nascent hydrogen produced by electrolysis or other means, sulphuretted hydrogen, or sulphurous acid, either set free directly in the liquid or previously generated and then passed into the liquid may be used for the purpose. The liquid must be subjected to the action of the reducing agent until all ferric salts present have been converted into ferrous salts.

This accomplished, the next step in the process is to treat the solution with oxide of zinc in order to completely saturate all free acid and produce a liquid which does not materially affect mineral pigments and aniline colours. This treatment can be conveniently accomplished in a wooden tank or vessel lined with lead, supplied with a steam coil or pipe by which the contents of the vessel can be heated without diluting the same by condensed water. The liquid is first heated to a temperature of 100° F., more or less, and a quantity of oxide of zinc sufficient to produce the desired neutrality is introduced either in its dry state or moistened with water. The liquid is stirred during several minutes until all, or a portion, of the oxide of zinc has dissolved. It now remains to test the neutrality of the solution. I find artificial ultramarine blue to answer the purpose well.—April 20

WHEAL UNY.

considerable disappro

SIR.—It has been with considerable disapprobation that I have read this correspondence from the first until now. I do not wish to enter into the merits of the case, whether there has been mismanagement or not, and if inclined to do so I should not think it fair to do so anonymously, yet now that it has been commenced I do not see how stopping the discussion can be satisfactory to either the manager or to the shareholders. Wheal Uny is a mine of far too great importance to be left under a cloud which probably an enquiry might dispel. The shareholders are I believe scattered far and wide, and some of them may have been influenced by what has transpired, disastrously to the interests of the mine. As an old miner, interested in the success of some of the mines in the neighbourhood, and certainly not antagonistic to any of them, I may offer an opinion that it would be more satisfactory to all parties, even to the manager who has been attacked, that the thing should be investigated by responsible parties, and an unbiased report issued. Although I would never attack a man anonymously, or shoot him from behind a hedge, I claim to be permitted to write in a general way on a public matter, and to subscribe myself.—

SO-CALLED "MUSHROOM MINES," VERSUS DISINGENUOUS

AND UNSCRUPULOUS DETRACTORS.

SIR,—I know nothing whatever about "Cautious," which is just about as much as he knows concerning East Chiverton Mine; but I wish to draw a parallel, which, as you have admitted his communication into the Journal, you will, no doubt, with your usual impartiality, place this letter under the eyes of your readers. When "Cautious" wrote to you he had not the slightest intention—not he to injure East Chiverton, but he was only amicably disposed to place it under that negative aspect which was calculated to scare the shareholders and to prejudice the property with the public, and I cannot be supposed to have any intention—not I—to detract from the merits of "Cautious," but only to serve up to him his own sauce wherewith to digest the conclusions he seeks to establish.

Now, Mr. Editor, I can positively state I have never heard that the individual in question ever thought, said, or did one honest, straightforward thing in his life. Moreover, I never heard that on any occasion he gave utterance to one word of truth, or that he was otherwise than wilfully and maliciously disposed when he wrote something very sapient about a silver "spoon." Pray, Sir, do not call this slander, for I assure you it is nothing of the kind; it is all strictly and perfectly true. I never did hear anything in favour of "Cautious," and not a syllable has reached me in testimony of his honesty, his candour, his honour, or his truth; indeed, he may be the veriest miscreant on the face of this terrestrial sphere for anything I know to the contrary, and if the proclamation of this undoubted fact is to tell against him, why really I cannot help it, nor can I be held responsible for the consequences.

KIT HILL TUNNEL.

SIR.—Is not some explanation due to the public why this company after a very brief existence, to be counted by months, went into liquidation, and now the liquidator finds it necessary to ask that the whole amount (5*l.*) should be called up on each share, 1*l.* only having been called up in the first instance, and 10*s.* more in July, 1878? The application of the liquidator that the remaining 3*l.* 10*s.* should be called up was to be heard in Chambers before Vice-Chancellor Bacon on the 12th of this month, but I have not heard the result nor seen *any record of the hearing in the X. L. A.* E. W. A.

E. V. A.

MINING IN Llanarmon

SIR.—The old saying that "after a storm comes a calm" has been to a certain extent verified respecting the above, as some short time ago there was quite a "freshening breeze" of correspondence on Mining in the Llanarmon district, but of late your columns have contained nothing upon the subject except the weekly reports from such mines as Bodidris, Llandegla, and Lead Era. It is very refreshing, I am sure, to see the reports resumed of the above-named mine, and I hope the efforts of all combined in the company will be handsomely rewarded by the discovery on their property of such an amount of lead as will make it a veritable Era in mining. Although the Journal has contained no correspondence on mining in this district for some weeks the good work has been going on quietly and perseveringly, and so far to the good, and work at many points is showing great probability of reward. Fresh capital is being brought into the district and laid out upon work which is likely to be highly remunerative. Besides the works already named I am pleased to know that Capt. Wm. Francis, of Northop, has two undertakings in hand, one at the Nant Wood, and the other the Lady Anne Mines at Nant-y-Palme, both of which are highly spoken of, the latter particularly, as likely to be the most remunerative for the least outlay of any in Llanarmon. A high value is already set upon the Lady Ann Mine, and it appears deservedly so, being situate, as it is, immediately adjoining to the west of the Old Westminster Mines, the Brynwyn, and the Pant-y-gwlaned properties, the proved lodes of which run for a distance of about 400 yards through the Lady Ann sett. There are other proved veins in this very valuable sett, making about six in all; in fact it is spoken of as being a network of lodes and caunter lodes. Capt. William Francis is to be congratulated upon the very valuable discovery made upon the Westminster lode, in which the men are now driving east under his instructions. The men in sinking have already cut a string of lead varying from $\frac{1}{2}$ in. to, over 1 in. solid for about 15 in. long, and they are now driving east to catch this in depth, and there is every probability that they will be suc-

I hear Bryn Alyn Lead Mining Company is being reorganised, with every prospect of successful operations, and that the works at the Nant Adda Day level are to be prosecuted with great vigour under good auspices. To all of these works I wish the greatest success. Can any of your numerous readers give me any information upon the Westminster United Mining Company, Llanarmon, as to situation,

mining properties, and the name of the working captain? I should like to know, as it may do good, and is certain not to do any harm.

present proprietor is the Rev. T. Hicks, Torquay. There is a large cross-course in Dereenatra, near where I raised the cargo of ore, and near it is also the boundary of Kilbrongue sett. This sett has never been worked. It is an extensive townland, and in some costean pits I have seen fine gossan on the back of the lodes, with other indications certain to lead to good results. Lord Bandon is the owner of this property. Dereenatra and Kilbrongue setts extend to the harbours in Castle Island Sound. There are good roads from the mines to the quays, and the land carriage would not probably exceed 1s. a ton.

TECHNICAL EDUCATION OF MINERS.

At the last monthly meeting of the Mining Institute of Cornwall, held at Camborne (Capt. W. TEAGUE presiding), Mr. TWITE, of St. Agnes, read a paper on "The Technical Education of Miners."

Mr. TWITE commenced by tracing the efforts which had been made during the last 30 years for the promotion of technical education in this country, and he went on to say that it was soon after the establishment of the London School of Mines, in 1851, that efforts were made by some of the leading men in Cornwall interested in mining to establish a local school of mines. It was felt that in this district there were many who, while unable to meet the expense of the London curriculum, would gladly avail themselves of the opportunity of a county school to gain that instruction which was felt to be needed. Funds were liberally supplied, the Royal Institution of Truro generously assisted with the prestige of its position as a scientific society, and provided the school with a locale. The early success of the school was great, not so much in the number of pupils who attended, but more in the nature of the work accomplished, and in its influence upon the men who passed through it as students. After a time the school had to be closed, and the influence of its promoters and supporters was directed into another channel—the educational classes of the Miners' Association of Cornwall and Devon. The idea of the founder of this Association was decentralisation. Accepting the fact that there was on the part of the young miner an earnest desire to avail himself of any facilities afforded him to become acquainted with the principles of science, it was proposed that instead of the young men leaving their homes and their work to attend classes at Truro, there should be established classes in every mining centre, and travelling lecturers appointed, so that the students should take advantage of the technical education of the class-room while following the industrial training of the mine. For 20 years this system had been followed, from the Trescan to the Land's End, and had been of work and

been followed, from the Tamar to the Land's End teachers had been at work, and many hundreds of young men had passed under their influence, with results equally advantageous to the students and satisfactory to the friends of the Association.—After briefly defining what technical education was, Mr. Twite proceeded to say that before they could commence to give technical education to the miner he must have a knowledge of those branches of science on which his art depends. In the first place, a better knowledge of elementary mathematics should be encouraged. Every young man engaged in mining, and anxious to obtain a high position therein, should have a knowledge of algebra sufficient to work out a simple equation; he should know enough of plane trigonometry to be able to calculate heights and distances from given data, and to be able to check the dialler's work. He should also know the principal laws of physics and mechanics, and with this knowledge he would then be able to study the arts of surveying, machine construction, the use of air, steam, and water as motive powers, the forces of explosives, the various modes of resisting pressure, of hauling shafts, and the various processes in the mechanical preparation and dressing of ores. The importance of surveying was apparent to all, and yet he was inclined to think that this subject had not progressed at all in proportion with other matters. Every mine should be dialled and mapped by its own agents who, by this work being put upon them, would have an accurate knowledge of the many changes of the phenomena of the underground riches entrusted to their care. The importance of mechanics and mechanical construction would be at once conceded by everyone who had walked over the surface of a mine. Apart from the steam-engines, which belonged more generally to the province of the engineer, but with which the mine agent had really so much to do, there remained an enormous scope for the application of knowledge in the economy of space, the distribution of power, and in the mechanical combinations found in the machinery of the dressing-works. And, perchance, it was in this department that the greatest difficulties

dressing-rooms. And, perhaps, it will in time become of great general utility in gaining information. The available literature of the subject was sadly deficient, and it was only by the wearying process of passing from mine to mine, and closely watching and following the various and varying processes that one could learn anything really valuable upon the subject. The second point of science on which the miners' arts depend was chemistry. This served as the basis upon which were dependent geology, mineralogy, and the art of assaying. To the miners the power of ascertaining the composition of rock masses, of mineral impurities, and of determining their value economic or otherwise, was of vital importance, and it was because of this that such stress had always been laid on a knowledge of chemistry and mineralogy. But it was in the teaching of assaying, whether it be the preliminary examination by the blow-pipe, or by the various processes known as assaying proper, that the technical education of the miner was mostly benefited by this knowledge of chemistry. Every miner should possess, and know how to use, the blow-pipe. Its first money cost was very small, the power to use it easily acquired, while the pleasure, occupation, and benefit to be derived from it was almost incredible. The importance of assaying by the wet and dry methods was at once apparent. The study of this should be preceded by that of the nature and value of the different kinds of fuel used in the several parts of the world, and the many different ways of preparing charcoal, together with the utilisation of peat. Speaking of the best means of providing technical education, Mr. Twiss remarked that before classes could be formed in the different districts teachers and apparatus must be found. The idea of a Central School, where one might be trained, and the other collected, was one that at once presented itself, only, unfortunately, to be put aside as impracticable. But might it not be possible, in Camborne, which was the centre of a large mining district, and under the auspices of the Mining Institute, that a beginning might be made? Through the liberality of one greatly interested in the mining of the district, and in the welfare of those engaged in it, a building had been provided which might be available as the home of the new effort. Here, a collection of working models of machinery might be gathered together, illustrative of the systems employed in the district. This could soon be supplemented by models from other home districts, soon again to be followed by others illustrative of foreign models. Where models could not be obtained, working drawings might take their places. In this way, gradually but surely, the foundation for a course of lectures on the machinery in use in the different departments of mining would be laid. An interest in the subject would be kindled by the act of collecting, would be deepened as the collection increased, and the discussion that would be raised on the merits of the different machines employed for the same purpose would stimulate enquiry as to the principles involved in the work to be done, and the suitability of the means employed. For the encouragement of teachers in technical education, he drew attention to the "City and Guilds of London Institute for the advancement of Technical Education." The formation of this Institute had been brought about by the action of the rich companies and guilds of the City of London, encouraged by modern discussion, and guided in its action by the opinions of scientists, and men engaged in the highest branches of trade and commerce. Following somewhat in the lines laid down by the Department of Science and Art, without hampering itself and others with many of the absurd provisions of the Department, it had engaged the services of many of the best men in preparing a syllabus of subjects for study and for examination. When the names of Dr. Foster, of Mr. Darlington, and of Mr. Henderson, were found appended to the subjects of the blow-pipe, of the dressing of ores, and of mine surveying, confidence would be inspired not only in these subjects but in the others. Examinations would be held, conducted in a similar manner to those of the Department, certificates awarded to those passing the required standards.

Dr. LE NEVE FOSTER said he thought the first question they had to ask was whether the miners required technical education or not, and whether it was worth while to educate them. If anyone hoped that by educating the miner and teaching him chemistry, the use of the blowpipe, or surveying, if they hoped to make him bore his holes better, or plan them better, or put in timber better, he did not think they would succeed. But among the young miners they wanted to pick out the best men and prepare them to be the future agents, or foremen of the mines. (Hear, hear.) For this purpose he believed that the classes suggested by Mr. Twite would be very useful; because if the young miners who they hoped to make agents hereafter were taught to know more about minerals so that they might be able to discriminate between those they might meet with in foreign countries; if they were taught something about the modes of dressing that were in use in other parts of England, and in foreign countries; if they were taught, also, about other methods of winding, there was no doubt that all this information would be of use to them, and would fit them to be better agents than would otherwise be the case. (Hear, hear.) It was, therefore, both in the interests of employer and employed, that classes of this kind should be formed, and good would certainly result from them to the men themselves, to the present managers of mines, and also to the shareholders. And he thought that in that way a stigma which rested upon Cornwall might be removed. There might be those in the room who were inclined to think that Cornwall was pre-eminent as a mining county. But a remark was made to him the other day by a foreign gentleman, who said that in consultation with some of the first authorities in Germany he mentioned his intention of visiting Cornwall, when their reply was "We certainly should not recommend you to go there. You will be simply throwing away your money to go down into Cornwall and see the manner in which mining is conducted there. You will see nothing but antiquated processes of mining and dressing—things that have been given up in other countries—and we should advise you not to go." Now, that was the opinion of gentlemen who were very well qualified to observe for themselves. He would not go so far as that himself, but he certainly thought that one result of a visit to Cornwall on the part of a foreigner would be to see many things not that he ought to keep, but that he ought to avoid. It was not a pleasant thing he knew for people to be told that their processes were old, and that they were not doing as well as they might, especially when those people thought they were the best miners in the world. At the same time, it was no good shutting their eyes to the fact that there were in Cornwall many things capable of improvement. His own opinion was that some improvement might result from the formation of these classes, and he thought also that the City and Guilds of London Institute deserved great thanks from the county of Cornwall for the efforts they were

their programme was by any means perfect. They were only feeling their way to the best means of promoting technical education, but he thought that unless this county took the opportunity which was now given it of forming these classes, the money which the City and Guilds of London Institute proposed to spend for the furtherance of technical education might be diverted to some other channel. He, therefore, suggested the advisability of the members of the Miners' Association and the Mining Institute doing all they could to further the introduction of classes, especially in the two subjects of mine surveying and ore dressing. He was quite certain that great good would result from the information that was thus given to young miners who would some day become mine agents. (Applause.)

Mr. B. KITTO having had considerable experience in teaching classes similar to those mentioned by Mr. Twite and Dr. Foster, said he knew there was a considerable desire on the part of a great number of young miners to acquire such technical education as would be of benefit to them in the prosecution of mining. For many years classes had been held in various districts in the county, in which the sciences referred to in Mr. Twite's paper were taught. Those classes had been fairly well attended, and the results, so far as they could be proved by the examinations, had been very satisfactory indeed. Considerable attention was paid to the study of chemistry, and next to that came the subject of mineralogy, which was not studied very much in other parts of England, and it was surprising to find how great was the knowledge of minerals at the present time, compared with what it was before these classes were established. Machine construction and drawing had also received great attention, and for several years there had been a class on that subject at Camborne, taught by Mr. Bickell, who was now in the drawing office of the Hayle Foundry Company. It had also been taught at Hayle with much success. There had been classes likewise on the subjects of steam, the steam-engine, and the principles of mining, in which the processes that were in operation in other parts of the world were brought before the students. But he was afraid these young students had not received the encouragement they might have expected from the mining community, and the consequence was that many of them had emigrated to other parts of the world. The subjects which perhaps required, and no doubt would receive, more attention in the future than hitherto were those of mine surveying and the dressing of ores, in times past the funds of the Miners' Association had not been sufficient to pay teachers for instructing classes in as many subjects as they would have liked to do, and therefore the operations of the Association had been limited. But since the City and Guilds of London Institute had embraced those subjects he hoped to be able to form classes in them directly competent teachers could be found to instruct them. With regard to assaying a good deal had already been done in that direction, classes having met for two winters at the laboratory, in Camborne, for the study of that subject. Hitherto the attention of the students had been directed to the assaying of such metals as silver, lead, tin, copper, and iron, these being metals that were mined in this and other parts of the world. But by-and-bye they hoped to extend the subject to other metals, such as manganese, zinc, and so on. Three or four months ago he tried very hard to get a class started for instruction in mine surveying, but, although he applied to several people in the county who he thought were competent to teach it, they declined to do so, their opinion being that the education which the young men had received was not sufficiently good to enable them to go through the syllabus which Mr. Henderson had chalked out as being necessary in order to pass the examinations and receive certificates as competent to survey mines. In connection with assaying, a considerable amount of work was done in assaying by the blowpipe, and the county was indebted very much indeed to Dr. Foster for a spread of the study of the blowpipe, and its use in assaying minerals. There certainly was no one in the county who had done anything like so much to spread a knowledge of the use of the blowpipe as Dr. Foster had done, and it was mainly through that gentleman's exertions that the City and Guilds of London Institute had granted a sum of money every year to pay teachers for instructing young men in the use of that simple but very effective instrument. (Applause.) It was a pretty good sign that a thing was wanted when the Government of the country took it up. The Government had spent large sums of money every year in the promotion of technical education, and last year something like 30,000/- was spent in that direction. It must, he thought, be patent to everybody that a person who had a knowledge of the principles of mechanics, theoretical and applied, of the construction of the steam engine and the power of steam generally, and the several other subjects mentioned by Mr. Twite, must be a better man, as a mine-agent, than he would be without that knowledge. The Miners' Association were anxious to carry out a scheme of scholarships for the most deserving and clever of the young men who attended their classes. The Science and Art Department in London would grant 25/- a year towards the support of any young man who might succeed in the classes, provided the localities would raise a similar amount to pay his expenses as a student in one of the colleges in London, and he had no doubt it would be a great encouragement to harder study than had been given in the past, on the part of the young men attending the classes, if they knew that such a scholarship was open to them. (Hear, hear.)

The CHAIRMAN said he did not wish to utter any note of disengagement, but he pointed out that the Miners' Association had been established for twenty years, and teachers were obtained who professed to teach a knowledge of dressing and dialling, but he asked where the pupils were, produced from this teaching, who had done any good to the immediate neighbourhood. There was no doubt that they were indebted to Dr. Foster for having spread a knowledge of the use of the blowpipe, but he had yet to learn what the good results were that had been achieved from all this teaching. He was afraid the tune was pitched a little too high, and he thought those present would agree with him that that was so. (Hear, hear.) He inferred from what had fallen from Mr. Kitto, that in times past there had been a loss of certain minerals in consequence of a want of knowledge of what those minerals were. But if that were so, he should like to know where they had gone. He confessed that he was not aware of any such loss or waste. He admitted that Mr. Twite's paper was a very valuable one to young men, but he saw difficulties in the way of such teaching being given, because up to a certain age young people had to be kept to school, and after that when they went to work, there would not be much opportunity for them to gain a technical education. His own impression was that this technical education should be part of the instruction given at school, and unless that was done he was very much afraid that the suggestions contained in the paper could not be fully carried out. (Hear, hear.) He was a very strong believer in teaching the head, but there was such a thing as teaching the head too much, and forgetting the teaching of the hand. There were many things connected with mining quite as important as dressing and dialling. Take, for instance, pitwork. How long would it take a man to learn to do pitwork properly? All the books in Christendom would not teach him that. The same observations would apply to timber work. Then again, with respect to the breaking of ground; he knew that many people differed from him, but he was of opinion that there was an art even in that, and that it could only be learnt by practice. Therefore it was useless to teach the head to enable a man to cope with the world, unless the hand was taught also. The two must inevitably go together. He should like to see the number of young men who passed the examinations and obtained certificates greatly increased, but it occurred to him whether it was fair to ask the mining community to subscribe towards that object when the moment those young men succeeded in their aim, they went away to other places and other countries. They did not become agents of Cornish mines, and even if they did they would have to compete with men who had very little head-work, but a great deal of hand-work, and he did not think they would cut very good figures by the side of such men as these, until they acquired a knowledge of the work by practice. He thought these were matters worthy of their consideration. As he had already stated, the Miners' Association had been in existence for 20 years, and he asked whether there had been any proportionate results for the amount of money which had been spent during that time? (Mr. Twite: Yes.) Well, Mr. Twite might be right but he doubted it. No doubt the Association had produced a few good men, but where were they? They had gone abroad, and Cornwall certainly had not reaped any advantage from the education those young men had received. (Hear, hear.)

Dr. FOSTER said he quite agreed with Capt. Teague that a young man who simply attended the classes of the Miners' Association would not thereby be fit to manage a mine or to take an agent's position. Nor did he think that a pupil who had been at any mining school in the world would be fit to take any responsible position in a mine unless he had had the opportunity of making himself practically acquainted with its various methods of working. As Capt. Teague had very properly stated, the hand should be taught as well as the head, and he quite agreed that it was impossible to learn how to break ground, or to put in timber, or to know much about pitwork, unless a man had actually seen these things and been engaged in them himself. But in the classes of the Miners' Association they were supposed to be dealing with young men who had ample opportunities of obtaining practical instruction, with young miners who, during part of the day, were engaged in the mines. It had, therefore, never been the aim of the Association to teach a man how to plan a hole, because it was supposed that he had been learning that work underground, but they had endeavoured to give him a certain amount of scientific teaching which would help him in his daily work. He quite agreed with Capt. Teague that it was somewhat difficult to point out those pupils of the Association in the county who had obtained situations, or done much credit to the county by the information they had received. But the reason of that was that the successful students had obtained situations elsewhere, and gone abroad, and if a list could be obtained of those pupils he believed it would be found that the money spent by the Miners' Association had been well spent. (Hear, hear.) The amount was really very small. The total income of the Association received from subscriptions at the present time would not be more than 120/- a year, and about one-half of that amount would be contributed by just three persons. And taking the sum of 120/- a year, that would simply represent the cost of driving a chance cross-cut in a mine, of 10 fms. at 12/- per fathom. That amount of money was very often spent in a mine in that way, he would not say uselessly, but certainly without any thought of the money being wasted. (Hear, hear.) He thought himself that had been done, although they might not be able, in the county itself, to put their fingers exactly on the most successful pupils.

Capt. TEAGUE, jun., thanked Mr. Twite for his excellent paper, although he did not altogether agree with everything he had said. He quite thought, with other speakers, that science and practice should be combined. Dialling he regarded as a very important part of mining operations, and thought that all agents, and especially young men, should make themselves acquainted with it. It was also very important that there should be a more accurate survey kept of their levels. In his opinion there should be a ground plan of every level kept separately, and the width of the level given at the same time. Oftentimes lodes varied and went off in different directions, and if a plan of the different levels was kept they would be able to see at a glance where the lode would be likely to have sprung off from. He suggested also the formation of a school for the sons

of mine agents and other young men of that class, certificates and rewards being given to the most successful of the students.

Capt. DADDOW said he had no doubt the young men learned a good many things at these classes, but he had never seen a practical miner come out from them yet, unless he was a miner before he went in. (Hear, hear.) He believed in education as much as any man, but if they were going to have miners they must educate the men who had been practical miners before they went to those schools at all. Mr. H. P. VIVIAN said the Germans were scientific miners, and he should like to know whether they were practical miners as well. If they were, how did they become so?

Dr. FOSTER replied that in Saxony there were two classes of schools—the Mining School and the Mining College at Freiburg. The Mining School, to a great extent, resembled the Miners' Association of Cornwall. The pupils were taken from among the working miners who would be working at the mines during the day, getting that practical instruction in mining which, as Capt. Daddow had stated, was indispensable, and in the afternoons they would receive instruction in mechanics, drawing, mathematics, dialling, mineralogy, and kindred subjects. Those were the men who were being trained to be agents, and they had practice and theory going hand in hand, as no doubt they must go. Practice alone, without theory, would certainly enable a man to work a mine and manage a mine, but theory alone would not enable him to do either. (Hear, hear.) But if they could combine scientific knowledge with that practical knowledge he believed they would have better men than practical men who had no scientific knowledge at all. (Hear, hear.) And that was all that the friends of the Miners' Association contended for. With regard to the Mining College at Freiburg, before any Government pupil was allowed to go there he had to undergo six months of practical working underground and at surface, and before he attended the lectures on smelting he had to go to the smelting works, work at the calciners, roast the ore, attend to the furnaces, and do other similar work. And then, after having attended the lectures he was obliged to work for an entire year at one or other of the mines, so that it was impossible for any man in Germany to obtain a situation under Government unless he had both a practical and scientific knowledge.

After a few other remarks Mr. Twite was thanked for his paper, and the Chairman having been thanked for presiding, the meeting closed.

the past six months the stocks of tin had got into the hands of some large speculators who were able to influence the market to a great extent. His own impression was that the downward tendency was due to the action of these speculators, and he maintained that looking to the decreasing stocks of tin since 1878, and looking to the increase in the deliveries, and consequently in the consumption and demand, the outlook for tin during the present year was better than in July last. It had been said that America was going to send back tin to England, but instead of that the whole stock of tin in America was not equal to two months' consumption. Therefore, to the mind of a sensible man, the consumption of tin would be increased and the stocks decreased, and he believed that by the end of the present year they would see tin at a better price than it had been for five years past. (Hear, hear.) Having again congratulated the shareholders on the improved position of Wheal Grenville, and expressed his belief that it would soon take rank amongst the leading mines in Cornwall, the Chairman concluded by moving the reception and adoption of the report and accounts.

Mr. W. H. BUMPUS seconded the motion, which was carried unanimously.

The CHAIRMAN said their liabilities amounted to about 1800/-, but of that 823/- was for the dues and damaged land, which had to be paid in instalments. With regard to the swin-engine, that could be left to pay for itself, as it would effect a considerable saving in coals, or it could be paid for out of the April sales of ore. They could thus go on without making a call, and he thought that course would be more acceptable to the outside shareholders. But though he was the largest shareholder, and would have most to pay if a call were made, he was quite willing to accede to the wishes of the shareholders if they considered it desirable that the liabilities should be provided for.

Mr. BELLINGHAM thought it would be better to have a call, which would enable them to clear off the whole of the liabilities, which sooner or later would have to be met. At all events, they could not honestly pay a dividend while they were in debt, and he would, therefore, in the hope that they would shortly be in a position to pay a dividend, propose a call of 5s. per share. —Mr. HERITAGE seconded the proposition.

Mr. F. LANE remarked that until the lord's dues were paid their leases would be in abeyance, and though they had an agreement in hand he thought it would be better that the company should hold the leases.

Capt. HODGE, in reply to Mr. WADDINGTON, stated that they intended to have a 3½-in. boring machine, with one compressor. —Capt. HODGE, in reply to a further question, stated that they were paying 15s. 6d. per ton for their coals.

Mr. WADDINGTON asked what was being paid for coals at South Frances? —Capt. ABRAHAM JAMES said they were paying 15s. 6d. per ton with a good discount at South Frances.

After some conversation the call of 5s. per share was made, payable on or before May 15.

The CHAIRMAN, after referring to the services which Capt. Hodge had rendered to the company, said he thought their thanks should be accompanied by a more substantial form of recognition than mere thanks. He would not ask them at present to go into the question of the future remuneration of the manager and secretary, who were, he thought, underpaid; but as a tangible recognition of the services rendered by Capt. Hodge he would move—"That the best thanks of this meeting be tendered to Capt. Hodge for the careful and satisfactory manner in which he has carried out all the new works authorised to be undertaken, and that the sum of 50 guineas be paid to him as a slight recognition of the services which he has thus rendered to the adventurers."

Mr. WADDINGTON suggested that the sum should be 100 guineas; and the CHAIRMAN at once altered the motion to meet that suggestion, which was received with applause. —Mr. WADDINGTON then seconded the motion, and it was carried unanimously.

The meeting closed with the usual compliments to the Chairman and committee.

At the close of the meeting an informal conversation took place with regard to the hardship under which tin producers are still suffering owing to the smelters and speculators in the metal; and the CHAIRMAN said he trusted that capitalists interested in mining—and he would be pleased to make one of the number—would join together and put an end to the existing monopoly, for such it is undoubtedly. If the demand and statistics are as they ought to be, the basis to be paid for the price of tin, then assuredly the present prices are very much below what they should be. It is much to be hoped that Mr. Goold's suggestion will be acted upon, and that the existing anomalous state of affairs may be remedied.

LLANRWST LEAD MINING COMPANY.

The sixth ordinary general meeting of shareholders was held on Tuesday, at the Guildhall Tavern, Gresham-street.

Capt. GILBERT presided.

Mr. W. H. PYNE (the secretary) read the notice calling the meeting, and the minutes of the last, which were confirmed. The report was taken as read.

The CHAIRMAN: Gentlemen, in moving the adoption of the report and accounts as presented to the shareholders, I think it will be unnecessary to detain you for any length of time with remarks concerning the actual property itself, because the directors have taken the precaution of having present the agent of the mine (Captain Knapp), who will give all details concerning the mine; and, of course, it is better for you to have him to explain matters than one like myself, whose experience is not of a technical character. There are also reports from various gentlemen which we shall be happy to have read to you, describing the character of the mine and the various points that require seeing to, and also the necessity for certain sinking operations. For the purpose of sinking to a certain depth that was required we applied for this capital, of which the proceedings which have just been read to you were the result. The result of the application was that we got a fair amount of applications at an early stage of our going to the shareholders, and a certain number of the shareholders expressed their desire to go forward, but asked for a certain amount of time to make their payments. But the directors, seeing the necessity for proceeding with the sinking, and knowing it to be absolutely necessary, took this into consideration, and sent round a circular—which was, doubtless, received by all present—saying they should only go to allotment with the preference capital in the event of their seeing a sufficient amount of money subscribed to develop the mine as considered requisite by the agent, Capt. Knapp. In response to our second appeal numerous letters came from shareholders, stating they were prepared to pay at certain intervals certain instalments, and we, therefore, made the allotment. But I regret to say that many of those shareholders have not come forward with the money. Those who promised have not responded to the extent we desired, and it will be a disagreeable proceeding, but it will be requisite (they having induced the directors to go forward with the mine) that the directors must procure the money from them. But, even in addition to that, you will find that a further sum would be required; and I think everyone remembers that when I last had the pleasure of addressing the shareholders of this company I was not in a position to give them very cheerful accounts of the appearance of the metal in which we are all interested, because it was then at a wretchedly low price, and it appeared as if the American market was entirely cutting us out. But I am happy to say that since then the general revival in the markets and the increase of wages have precluded mining operations being carried on at much profit in America; so that we can sell our lead at a satisfactory price, and reports are daily coming in stating that lead is improving in price. As the directors say in their report, a parcel was sent into the market some time ago, but we were rather unfortunate, for there was but just a temporary lull in price. It had gone down certain 30s. a ton, but of course we felt bound to send the lead into the market, and the price we obtained was 10/- 5s. That is not satisfactory, and it is a sum that will not at all exceed will be the general average, in fact, from all I can learn, and I made every effort to enquire prior to this meeting—I believe lead will soon be at something like its best price in the last few months—about 12/- a ton. Of course if lead gets up to the price it was at when this mine started it would be about 14/- or 15/- a ton. I think it was still higher—in fact, I know it was when this mine was started. The principal matter now of consideration is the sinking of this shaft some 7 fms. deeper. This will require about four or five months to complete, and I do not think it would exceed 800/- or 900/- for the operations. Seeing the improvement in the trade of the country, I think we have every reason to feel we are justified in coming forward and still further supporting the concern, because, as the statement of accounts will show, there are few mines in so flourishing a financial position, taking into account the very trying circumstances we have passed through. Of course we labour under certain disadvantages, as the laws which apply to most other mines do not apply to us. They are required to pay up call as required, but in this case the amount is limited. I should like all calls to be of limited liability, but it would have been a benefit to us if we had been able to call up the amounts required. But even in addition to that, you will find that a further sum would be required; and I think everyone remembers that when I last had the pleasure of addressing the shareholders of this company I was not in a position to give them very cheerful accounts of the appearance of the metal in which we are all interested, because it was then at a wretchedly low price, and it appeared as if the American market was entirely cutting us out. But I am happy to say that since then the general revival in the markets and the increase of wages have precluded mining operations being carried on at much profit in America; so that we can sell our lead at a satisfactory price, and reports are daily coming in stating that lead is improving in price. As the directors say in their report, a parcel was sent into the market some time ago, but we were rather unfortunate, for there was but just a temporary lull in price. 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Mr. GREGORY seconded the resolution, and expressed a strong hope that the shareholders would find the necessary funds to continue the operations at the mine, for if they abandoned it others would assuredly come forward and purchase it, and ultimately reap the benefit of their developments. No one could gainsay the fact that the company possessed a good property, for all who had inspected it had eulogised it in the highest terms. To double the return of ore all that was required was further capital to the extent of 1500*l.* or 2000*l.*

The resolution was carried.

The CHAIRMAN next proposed that the auditor, Mr. Swaffield, be reappointed.

Mr. EDEEN seconded the proposition, and pointed out that he was one of the largest shareholders in the company, and had not only subscribed and helped in every way for the past two years, but he had lately paid the expenses of three or four eminent mining engineers who were employed to examine the company's property. Their opinion was that no fault could be found with Capt. Knapp's working, and that the company possessed one of the most valuable mines to be found in the country of Carnarvon.

The re-election of the auditor was then agreed to.

In reply to a suggestion by Mr. Scott that an appeal should be made to the shareholders to subscribe for three preference shares each, — The CHAIRMAN said it would be necessary for the shares to be subscribed for *pro rata*.

Mr. EDEEN said he had already put down 3000*l.*, but he would subscribe 100*l.* more if the shareholders would help in obtaining the 3000*l.* or 4000*l.* that was required to cover three months' costs of working, and also to pay the merchants' bills when due.

Capt. KNAPP said there could be little doubt that if the shafts were sunk a few fathoms deeper through the hard ground to which he had previously referred the ore would still further improve in quality, and 150 tons per month might reasonably be expected. The working of the mine up to the present had been crippled through want of means, but his confidence in it was unaltered, and as Mr. Edeen had offered to subscribe another 100*l.* he would subscribe 40*l.* towards the amount required. (Hear, hear.)

In answer to Colonel RODES, Capt. KNAPP said he calculated the shaft would take four months to sink to the lower level.

Mr. KENDALL said he inspected the mine 12 months ago, and was well pleased with all he saw. The mine was still in its infancy, and it would be absurd to abandon it to others after it had shown such favourable signs, and there was so much ore in sight.

Capt. LEAN said that he also had examined the mine. He considered the prospects were so good in the 14 that the further development should be proceeded with at any risk or expense. (Hear, hear.)

The proceedings then closed with a hearty vote of thanks to the Chairman for presiding.

THE PIONEER MINING COMPANY.

The first ordinary general meeting of shareholders was held at the Cannon-street Hotel, on Monday (Mr. HENRY HAYMEN in the chair), for the purpose of passing the following resolutions: — "That notwithstanding the notice issued by this company that the 16,000 shares of 1*l.* each, beyond the 34,000 shares of 1*l.* each, which formed altogether the first issue of 50,000*l.* of the capital, would not be issued at a less price than 25 per cent. premium, the directors be and are hereby authorised to issue the whole of the shares of the company at par or otherwise as and when they may think fit." Also — "That the directors be and are hereby authorised to purchase all, or otherwise acquire, from the Pant-y-Pydeu Consolidated Silver-Lead Mining Company (Limited), the lease of the mine, minerals, and other property of that company mentioned or referred to in the statement or description thereof attached to the notice calling this meeting, together with the machinery, plant, and other appurtenances at such price and on such terms and conditions, and to pay for the same in such shares of this company as the directors shall think fit, the Pioneer Company paying the expense of winding up the Pant-y-Pydeu Company, consequent on the transfer, or of all such other proceedings as may be necessary."

The CHAIRMAN said: Gentlemen, as you are aware this is not an ordinary but simply a statutory meeting of the company, called under the Joint-Stock Companies Act; but we have now, at the same time, to lay before you the offer we have had from the Pant-y-Pydeu people to amalgamate their company with ours. In order to do that it is necessary to pass a resolution authorising us to issue these shares at par. It is quite clear that if we asked the Pant-y-Pydeu shareholders a premium on their shares they would ask a premium on their property, and it would simply be as broad as it is long, for what they gave in one way they would receive in another. With respect to the Pant-y-Pydeu itself, you have had a considerable amount of information sent you in the notice calling the meeting; but I may tell you that some months ago, to my knowledge, there was a company which was prepared to give about 28,000*l.*, or something like double what this company is going to buy it for; in fact, if Mr. Adley, who is present, was not connected with the other company we should have had great difficulty in obtaining the property at all. We believe we can work the two companies at considerably less cost than we could otherwise, more particularly in respect to the London supervision of the mine, which will devolve, to a great extent, upon Mr. Adley, who is an engineer, and thoroughly up in all mining, and when he is in Wales looking after one property he can look after another. He has just returned from the mine, and will be able to answer any question which any gentleman may put. The solicitor of the company informs me that the necessary deeds with respect to the transfer of the West Merionethshire property will be ready in about a week, and then we shall be legally in possession; but now we are in possession *pro forma*. But in about a fortnight we shall be enabled to take legal possession of the Pant-y-Pydeu property, of which we are now in possession, subject to the approval of this meeting. I do not know that I have anything more to say. Any questions relative to the property will be answered by Mr. Adley, and any other question I shall be happy to answer myself. I now beg to propose that the resolutions which have been read be passed. — Mr. ADLEY seconded the resolution.

Mr. EDEEN enquired whether the whole 34,000 shares of the Pioneer Company had been allotted? — The CHAIRMAN: I will answer generally; it would not be judicious to give you the proportion. The whole of the 34,000 shares have not been allotted.

Mr. EDEEN: What amount of shares are you going to give for the new mine? — The CHAIRMAN: That you are told. The price of the Pant-y-Pydeu Company is 17,203*l.* in shares, being the shares in their company, which is their actual capital account at the present time.

Mr. EDEEN asked whether it was legal to issue the shares at par, in the face of the fact that the prospectus stated they should be issued at 25 per cent. premium? — The CHAIRMAN said it was perfectly competent for the shareholders, in meeting assembled, to pass the resolution for the issue of the shares at par.

The SOLICITOR: The resolution has been read, and it will be perfectly legal.

The resolution was then put to the meeting, and carried unanimously.

The CHAIRMAN said that Mr. Adley had brought back with him specimens of ore from both mines, which any shareholder could see at the office.

The meeting then broke up.

MELLANEAR COPPER MINE COMPANY.

The report of the directors, prepared for presentation at the meeting on April 30, states that the improvement in the price of copper, notified at the last general meeting, has had a gratifying effect on the result of the half-year's operations, and increased the profits considerably. The profit for the six months to the end of December was 3469*l.* 15s. 4d., making with the previous credit balance 3795*l.* 18s. 9d. to be disposed of. This was applied to the payment of February dividend, 2000*l.*; written off mining and general expenditure account, 500*l.*; added to reserve fund, 347*l.* — 2847*l.* leaving 948*l.* 18s. 9d. to carry forward. The balance which stood at the debit of the mining and general expenditure account to June 30, 1877, was 5156*l.* 15s. 4d., which represented the cost of opening out the mine before it became self-sustaining, and the directors think the shareholders will approve of this sum being written off as favourable opportunities occur. The reserve fund now amounts to 1037*l.* The expenditure on plant account during the past half-year has amounted to 1150*l.* 1s. 8d., which has been carried to the capital account.

The returns of ore have been well kept up, and have amounted to a little more than the quantity of the previous six months, but the average price realised has been 3*l.* 3*q.* 7*d.* per ton, or 9*q.* per ton more than in the first six months of the year. Although there has been some relapse of late in the copper market, and lower prices for that metal now prevail, it must be hoped that with a general improvement in the business of the country there will be a fresh advance in the prices of metals, so that the returns from the mine may again realise satisfactory rates.

The report of Capt. GILBERT shows that the rate of discoveries of ore has been well maintained, so that whilst keeping up the returns to about 540 tons per month as before, an addition of about 700 tons has been made to the reserves, which now amount to upwards of 15,800 tons. It is intended to sink the old engine-shaft as soon as possible below the 100, and when this reaches a proper depth for a level to be driven to the elvan course a good trial of the effect which this has on the lode will be made. The whole arrangements for the new dressing machinery are now nearly completed. Indeed, the engine and crushing mill on the new floors have been at work for three months past, and much advantage has been derived from them in the treatment of the ore.

Since the dividend paid in February the directors have been able to declare a further dividend of 2*l.* per share, payable on May 6, and they hope the profits may now enable them to pay regular quarterly dividends.

SANTA BARBARA GOLD MINING COMPANY.

The report of the directors, prepared for presentation at the meeting on April 30, states that the results shown in the statement of accounts for 1879 compare favourably with those of the preceding year. The total quantity of mineral raised from the Pari Mine in 1879 was 15,889 tons, as compared with 15,768 tons in 1878, and an increase of 121 tons; of this quantity 3198 tons were rejected at the spalling floors as refuse stone, and 12,691 tons were treated at the stamping mills, yielding, with 170 tons of refuse sand re-treated by the pulverising machine, 49,455 oits of gold, or an average of 3*q* 8*d.* oits. per ton of stone stamped. This shows an increase in the produce of 3374 oits., as compared with the previous year, and of 312 of an oitava per ton.

The net profit for the year was 7759*l.* 4*s.* against 4955*l.* 1*s.* 3*d.* in 1878, the low rate of exchange prevalent in Brazil during the greater part of the year having tended to reduce the expenses during 1879. To this amount of 7759*l.* 4*s.* is to be added interest and transfer fees received, less income tax, 45*l.* 9*s.* 8*d.* and balance of 1*s.* 6*d.* per share (3000*l.*) was paid in November, and from the balance of 467*l.* 2*s.* 1*d.* the directors recommend that 500*l.* be carried to reserve fund, thereby raising the same to 2000*l.* that 400*l.* be appropriated to the payment of a further dividend of 2*l.* per share on May 20, making a total distribution of 3*l.* 6*s.* per share, or 35 per cent. for 1879, and that the sum of 467*l.* 2*s.* 1*d.* be carried forward.

The manager's table of statistics and the mine captain's annual report give the usual detailed particulars of the operations at Pari during the year 1879. Mr. Tregellas states, in his general remarks on the working of the year under review, that the mine has continued to improve, the results shown being better than those of any previous year. The average yield of the mineral treated during the second half of the year reached the satisfactory standard of 4*q* 247 oits. per ton, a much better result than for some years past, and which may be ascribed partly to the improvement in the quality of the ore in depth, and partly to the more complete straking arrangements perfected by Mr. Tregellas. The prospects of the current year, as regards the maintenance of this improved produce of the ore, are, however, somewhat adversely affected by the recent falling off in the value of the lode at Nos. 6 and 7 stope south of No. 1 shaft, where, according to the latest news from the mine, it presented a disordered appearance, and contained an unusual quantity of killas, whereby the output of good ore is lessened. On the other hand, the lode to the north of this shaft appeared to maintain its auriferous quality.

The mine captain's report states that No. 1 shaft had been sunk during the year 5 fms. 4*q.* ft. on the course of the lode, which varied from 9 to 11 ft. wide, yielding fair quality mineral. On Oct. 4 last an accident occurred in the mine, the hanging wall of the lode in the southern section of the mine, and in the neighbourhood of No. 3 shaft, having broken away from surface down to No. 4 stope, filling the whole excavation from a little above No. 5 stope to surface; this accident, which was happily unattended with loss of life, has prevented the workings from being carried on in this part of the mine, and occasioned a considerable expenditure in the re-opening and re-timbering of the ground, a work which is being proceeded with as speedily as possible. The commencement of the new works needed for the development of the mine, alluded to in the last report of the directors, is intended to be made during the current year; the new tramroad, also referred to, was completed last autumn, and has been found of considerable advantage in the working of the mine.

As regards the provincial tax on the gold produce, to which allusion was made in their last report, the directors were glad to learn during the year that the collection of this impost was suspended by order of the Imperial Government. Mr. Hildebrand having had leave of absence granted him by the directors for the purpose of visiting this country in order to benefit his health, Mr. Thomas Tregellas under took the management at Pari until the restoration of Mr. Hildebrand's health should permit of the latter's return to the mine; but Mr. Hildebrand having died, the directors have now appointed Mr. W. H. Richards to the post of general superintendent at Pari, and from his long experience of mining at the St. John del Rey Company's establishment at Morro Velho and elsewhere in Brazil, they trust that they have secured the services of an efficient manager.

[For remainder of Meetings, see to-day's Journal.]

nical department of the Polytechnic Society was much valued. He was a most respected Cornishman, a very clever mineralogist, and a good miner, and was well known for his outspoken language at public meetings. With him words never concealed thoughts.

REPORT FROM NORTH AND SOUTH STAFFORDSHIRE.

April 22.—The result of the Quarterly Meetings, so far as new orders are concerned, has proved disappointing to the finished iron makers. The orders upon their books have not received any conspicuous additions taking the trade as a whole, and what is worse is that specifications for the contracts accepted some weeks since do not come forward with anything like the required regularity. Upon "Change" in Wolverhampton yesterday and in Birmingham to-day there were complaints that from this cause whole ironworks plants and parts of plants were this week standing, and that the same state of affairs had prevailed last week only to a wider extent. One firm were credited with having within the past few days booked a contract for 1200 tons of sheets for export, the delivery to extend over a considerable period; but this was the only new contract of much magnitude mentioned. Prices remained upon the basis of 9*l.* for branded bars, but there was a wider margin than ever between this quotation and the minimum price at which the common bars might have been bought; 7*l.* and even 6*l.* 15*s.* were mentioned as being these minimum prices.

Pigs are increasing in accumulations at makers' furnaces and in the hands of carriers for consumers who have contracts running are refusing, some of them, to accept delivery. A decrease of output is not unlikely if the demand should continue slack. Messrs. Sparrow, of the Mill's Furnaces, have blown out one of their two furnaces this week. Prices are easy at 4*l.* 10*s.* to 4*l.* 5*s.* for all mine sorts, and 2*l.* 10*s.* for cinder qualities. High class iron made out of this district are down largely upon the maximum quotations of a couple of months ago. Tredegar hematites are this week quoted by makers at 4*l.* 15*s.* per ton. They have run up to 6*l.* 10*s.* and even 7*l.* as a quotation since the revival commenced. Coal, alike furnace and forge, is not in average sale, and the collieries are generally making two-thirds time. A further declared drop in prices is looked for before very long.

The South Staffordshire Mill and Forge Wages Board meeting was held in Birmingham on Tuesday, for the purpose of laying before the President — Mr. Joseph Chamberlain, M.P. — the points in dispute in reference to the sliding scale. Mr. Chamberlain said he thought the men would be advantaged if the whole of the trade was under one board and one single arbitrator. He strongly advocated the amalgamation of the North of England and South Staffordshire boards. The employers' scheme provided that they should select six firms and the operatives six firms of bar-iron makers, and an accountant appointed to ascertain the selling prices quarterly, and a committee elected to fix the price per imperial ton in the following manner: — Every 1*l.* selling price to give the puddler 1*s.* in wages, and the fractional parts of 1*l.* to be regulated thus: from over 2*l.* 6*d.* to 7*l.* 6*d.*, 3*d.*; from 7*l.* 6*d.* to 12*l.* 6*d.*, 6*d.*; from 12*l.* 6*d.* to 17*l.* 6*d.*, 9*d.*; from 17*l.* 6*d.* to 1*l.*, 1*s.* Millmen's wages to be reduced or advanced the same as heretofore. Such rates to include all Northern extras, and the scale to remain in force for twelve months from January, 1880. On behalf of the men it was urged that in the North of England the ironworkers got 1*s.* 3*d.* per ton on the price of all classes of iron except rails, whereas here they only asked for 1*s.* in advance of the number of tons representing the selling prices of bars, which were the lowest priced class of iron manufactured in South Staffordshire. The meeting was adjourned in order to ascertain the average selling prices in the North of England.

The following circular has just been issued by the secretary of the Hamstead Park Colliery Company: — "I have much pleasure in informing you that we have struck the Thick coal at a depth of 615 yards. Further particulars will be given when the thickness and quality are found." The sinkers are now making good progress through the seam, which it is believed will prove to be the celebrated Ten Yard coal of South Staffordshire.

SYDNEY EXHIBITION. — In last week's Journal, announcing the award of gold medals to local exhibitors at the Sydney Exhibition, the name of Messrs. Barrows, Blomfield and Factory Works, Tipton, was incorrectly printed Parsons. Messrs. Lloyd and Lloyd, of the Albion Tube Works, Birmingham, have been awarded a gold medal for their exhibit of iron tubes and fittings. Messrs. Thomas Smith and Sons, of Saltley Mill, Birmingham, have been awarded a silver medal for their exhibits of solid cast-steel and other hammers, heavy edge tools, screwing tackle, general tools, and other of their specialties, including bicycle materials and fittings.

MINES DRAINAGE IN THE OLD HILL DISTRICT. — A new large pumping-engine was recently started at Waterfall Lane, Old Hill, for the purpose of draining the mines in that locality. The capacity and strength of the engine is such as will ensure the effectual draining of all the pits in the immediate neighbourhood. It was started in the presence of several gentleman connected with the mining interest.

TRADE OF THE TYNE AND WEAR.

April 21.—The disturbed state of the iron trade has had some effect on general business. The improvement in chemicals is, however, maintained, and prices are sustained with a good shipping demand. There is not much change in the coal trade; the steam coal trade in Northumberland continues good, but in Durham it has hardly been so brisk, as there is a fair demand for nuts, small, and all manufacturing coal. Substantial orders for steam and gas coal have arrived from the Baltic, and a large business in most classes is expected to be done this week. The shipment of coal at Tyne Dock on Saturday was large. Contracts are being made for small and other coal. The coke trade is very quiet, and recent sales have been made at 14*s.* per ton, but there is not much for sale in the open market, most of the coke made in the district having been contracted for some time ago. The iron trade has been in a very disturbed state during the past week, it appears that although the exports to America have been large and continue to be good there is a failure of confidence at present as to the future demand. The quantity of pig-iron exported to America last month was 106,302 tons, while last year in the same month only 3429 tons was sent. The shipments of rails and other finished iron were also large last month, while they were almost *nil* in the same month last year. Whether the United States will permanently take over iron on a large scale it is certain that this year they have found a valuable customer. At Middlesbrough on Tuesday the market was fairly attended, but opened with a very weak tone, and an indisposition to do business. Prices of pig-iron vary with nearly every buyer and seller, and there can hardly be said to be a market price. The stocks in store are lower over 3300 tons on the week, Messrs. Connall's stock being 89,000 tons. As the market proceeded, and there were no buyers, prices were weaker, though it was alleged to be largely due to the "bears." No. 3 was quoted by many of the middlemen at 42*s.* 6*d.*, with the same rates for No. 4 forge. Makers' prices are difficult to obtain; they quote considerably more. Iron has not been going off so rapidly, either in crude or manufactured state for shipment. Last week there were 13,546 tons of the former, and about 3900 tons of the latter exported. There is, however, as far as the month has gone, no cause to complain of the deliveries of either pig or manufactured iron. It is hoped now that the spring has arrived, and pig-iron has become cheaper, that there may be a demand for it in the general foreign market, without reference to America. The make of iron ought not at the present time to be increased. The Cleveland miners have not yet met the mineowners to arrange the question of the sliding scale. One of the Stockton ironworks has been laid off through a dispute with the section of the workmen. Coal and coke are easier to get, and lower in price. Coke is offered at 13*s.* 6*d.*, delivered in Middlesbrough in certain cases. Manufacturers generally ask for bars and plates about 7*l.* 5*s.*; ship-plates, 8*l.* 5*s.* to 8*l.* 7*s.* 6*d.*

At the North of England Institute of Mining and Mechanical Engineers meeting, on Saturday (Mr. J. B. Simpson, vice-president occupied the chair), the minutes of the council meeting read by the secretary, Mr. Bunning, stated that the committee appointed to con-

sider the subject of the establishment of a professorship of mining, and the desirability of the Institute providing the necessary funds, had reported.—"That it would be highly desirable to assist the College of Physical Science in carrying out its offer of providing £100,000 towards the establishment of a professorship of mining, provided the remaining funds necessary, and estimated at £80,000 per annum, could be raised, that the objects of the professorship should be generally to furnish satisfactory instruction to all persons desirous of obtaining responsible positions in mines, that—say, a large number of the members are not connected with the district—it would not be desirable to set apart any of the funds of the Institute towards the expense of the chair, but they think that the coal trade of the two counties could be appealed to for the necessary funds; the committee further recommend that the appointment of a professor and the course of study should be under the control of the Institute, subject to the assent of the council of the College of Physical Science, and that an endeavour should be made to extend the lectures of the professor to the different centres of mining industry in the two counties." The report was unanimously confirmed by the general meeting.

A paper by Mr. Wigham Richardson "On the strength of wrought-iron under compression" was read, and a description of an apparatus for preventing over-winding, by Mr. Charles Ianson was communicated by Prof. A. Friere Marreco, M.A. Discussion took place upon a description of an instrument for ascertaining the inclination from the vertical of bore-holes, and the direction of such inclination, by Messrs. C. Z. Bumy and J. Kenneth Guthrie, and on the extraction of oil and ammoniacal liquors in coking coal in ovens by Mr. Henry Aitkin, of Falkirk, N.B.

REPORT FROM DERBYSHIRE AND YORKSHIRE.

April 22.—There has been no change to report as regards the mining or manufacturing industries of Derbyshire since last notice. In the lead districts work goes on as usual, the output of ore being still of a moderate character. A considerable tonnage of ironstone continues to be imported from Northamptonshire, the production of pig being well maintained, although the demand is by no means so active as it has been, consumers looking forward to prices coming down to a lower point. The Coal Trade has fallen off so far as regards household qualities, and less is being done with the Metropolis from the leading collieries, whilst there is every prospect that, low as is the existing charge, it will be still less. There is, however, more doing in steam coal, which has been quiet for a considerable time past. Colliery owners still complain of the unremunerative character of the business being done, and it is not unlikely that the wages of the miners will be reduced during the summer, seeing there must be a still further decline in the consumption of certain descriptions of coal. Makers of coke have been doing a fair business, a good deal being sent to Sheffield and the neighbourhood.

In Sheffield the men at the mills and ordinary works are now well employed, and there is every appearance that they will continue so, for orders have come freely to hand of late. Ship and other plates are in good request, and so, indeed, is every description of mill material. Steel-faced armour-plates are now making considerable headway, and orders have been received from our own as well as other Governments for them. Some of those lately turned out consist of about 4 in. of steel, backed by 5 or 6 in. of iron, and have proved superior as regards resisting power to the more heavy iron plates, besides there being less displacement, a most important consideration. Bessemer rails continue in good request, America taking considerable quantities of them, but prices are scarcely so firm as they have been. There has been no falling off as regards general railway material, such as tyres, axles, springs, &c., the demand being still active. A steady business continues to be done in cutlery, especially in the finer descriptions of table and pocket-knives, America continuing to be a good customer for them, as well as for ordinary cast-steel. Engineers and mechanics are now much better employed than they have been for a long time past.

The Coal Trade of South Yorkshire is in anything but a satisfactory state, and is not unlikely to improve. House coal does not go off well, whilst the price of it is such as to leave no profit to the colliery owners. Not so much is being done with London, or, indeed, any of the southern markets. Steam coal has been in better request, but as the getting of it necessitates the throwing down of the soft coal on to the pit hills owners in some instances decline to do as much business as they might do were there markets for the household qualities. Coke goes off steadily, there being a steady demand for the works in Lincolnshire as well as in Sheffield for smelting.

On Tuesday a meeting of the South Yorkshire Steam Coalowners' Association was held at Barnsley. The proceedings were of the usual routine character, and no decision it was understood was come to as to advancing prices, which of late have been better than they were.

The strike at the Monk Bretton Colliery, near Barnsley, continues without any appearance of a settlement being likely. The men are supported by those who are in work, as they have been since September last.

REPORT FROM MONMOUTHSHIRE AND SOUTH WALES.

April 22.—In the Court of Appeal the case of the Manchester and Milford and Cambrian Railway Companies was heard. Previously the Cambrian Railway Company had, it appeared, presented a petition, they being judgment creditors of the Manchester and Milford Railway for the appointment of a manager of the latter company on the ground that the directors of the Manchester Company were not managing the line for the benefit of all parties, including creditors, but gave preferences to a certain coal trading company. This was denied on behalf of the defendant company, and Vice-Chancellor Hall dismissed the petition. The Cambrian Company now appealed, and the matter was ordered to be referred back to the Vice-Chancellor to appoint a manager without prejudice to the directors to propose themselves or anyone of their number for the office. The Corporation of Aberystwith are also disputing with the Manchester and Milford Company as to arrears of ground rent alleged to be due to the former. They threaten if the money is not paid to seize certain land which the company occupy at the station.

Five men employed at the Gethin Pit, Merthyr, have had a narrow escape of losing their lives. A cage containing them "ran wild," and they were precipitated to the bottom of the pit. All the men were injured—one seriously.

The Iron Trade of the district has been fairly active during the past few days. There is no doubt now that the American demand has to some extent fallen off, but a glance at the various works shows that there is a fair amount of business doing—in fact, trade has been so brisk that at one or two of the establishments there have been preparations made for the extension of the works. But if the Transatlantic demand has fallen off, as undoubtedly it has, South Wales is now by no means relying on the United States. There are some fair colonial orders in hand, and these are expected to increase. The quantity of iron shipped to the United States has been large, and has principally consisted of rails. To Philadelphia, however, a cargo of pig-iron has been shipped, and old rails are in fair request. Shipments are also being made to India, Egypt, Brazil, Canada, Australia, Turkey, and Spain, and so far prospects do not seem discouraging. For finished iron prices have not materially changed, and there is a steady demand for merchant bars. Pig-iron still fetches rather lower rates. A better demand for iron and steel on home account is also looked forward to. At Treforest Works large and increasing quantities of iron are turned out, and the new furnace is being rapidly pushed on. It is also stated that the Yniseddwn Iron-works are likely to be re-started after a few years stoppage. At the College Works, Llandaff, the men have received a month's notice to terminate contracts.

As for the Tin-plate Trade no change of importance has occurred either in the demand or prices, the latter remaining rather lower. The coal industry has been active during the past few days, and a good many contracts have been entered into, but at low prices, while the output is so large quotations can hardly be expected to improve. The demand for steam qualities has been up to the average, and shipments have been well maintained. The house coal depart-

ment has been fairly but not very briskly engaged, but taking the collieries of the district they are generally working more steadily. The enquiry for anthracite is somewhat more animated. The patent fuel trade is still somewhat dull, but prospects seem a little more improved. Freights have shown a somewhat downward tendency. Coal has been found by the Cardiff and Swansea Coal Company in their new pit at Resolven, in the Vale of Neath. The seam is 3 ft. 7 in. in the thickness, but as yet it is to soon to report fully as to its quality. The Penycraig seam of steam coals has been found in a pit in the Dulais Valley, which has been sunk by Mr. L. Lewis, of Neath. Exertions in prospecting for this seam have previously proved a failure, but at length Mr. Lewis's perseverance has been crowned with success. His taking comprises some 8000 acres. The Bedlinog new pits are expected to shortly be in full work.

REPORT FROM NORTH WALES SALOP, AND CARDIGAN.

April 22.—It is with pleasure that I record the continued success of the Llanfrynnach Lead Mines, on the borders of Carmarthen and Pembrokeshire. The monthly production of ore is stated at 100 to 120 tons. The region of this lead, more especially to the south-west, is one that may be commended to explorers for lead mines.

The slate quarries in the same region are not so busy just now. Glogue, the oldest quarry of the district, is not in such active work as it was. The new quarry (Elwyn Valley) seems waiting for a change of owners. Its slate rock is proved and partly open, and it is connected with the Whitland and Cardigan Railway by a short railway of 2 ft. 6 in. gauge. The Pencellyn Slate Quarry has had a good railway siding put into its works, and it is prepared to send off slates. Its incline, as seen from the railway, is one of the best constructed in Wales. The lower tunnel is just entering the slate rock, and in a few months this quarry will be well equipped for work. About five miles to the south-west are the cluster of quarries at which the greyish-green slates of the district are obtained, Gilfach or Whitland Abbey, Cleddau Valley, and one or two smaller quarries. The first of these has been successfully worked for years, and its slates are, if I mistake not, on the Charing Cross Hotel and other public buildings in London. It is now changing hands with the view of a company being established to work it on a large scale, and to construct a railway from the group of quarries in the midst of which it is placed to the Maenclochog Railway about four miles distant. All the way leaves and property required for this short line are secured, and its construction would be a boon to the neighbourhood.

At the Cleddau Valley Slate Quarry the production of slates was stopped last year in order that the quarry might be opened out for systematic working on a large scale; this is now partly done. One tunnel of 50 yards and one of 110 yards have been driven into the slate rock, and two lower galleries partly opened out. Some nice slates are being made at Price's Quarry on the Pembrokeshire side of the river. The quarries at the end of the Maenclochog line could do with more trade, and those along the coast on St. Brides Bay are nearly idle.

In North Wales more work is being done at the slate quarries along the Dee valley, but the stocks of slates seem accumulating. How is the New British Silver-Lead Mine progressing? I should like to hear of sufficient money being raised to prove and develop this thoroughly. The coal trade of North Wales is as quiet as it has been at all for some years past.

THE GOLD MINES OF SOUTHERN INDIA.

In connection with the question of the development of the gold fields of Southern India with British capital there are still many who, although satisfied as to the existence of auriferous reefs, have misgivings as to the facilities which exist for turning them to profitable account; it is, therefore, gratifying to find that Mr. R. Brough Smyth has given special attention to this portion of the subject. He states that the machinery and appliances for crushing auriferous quartz and saving gold are simple in themselves, and easily managed when the principles on which they are designed are understood. Neither that portion of the work of reduction which is purely mechanical, bringing the mineral into such a state as to admit of metallurgical treatment, nor the metallurgical treatment itself is of such a character as to call for more than the knowledge which is to be gained in any large quartz-crushing establishment. A competent superintendent may not be an engineer or a chemist, but he should have a sufficient acquaintance with mechanics and mechanical processes, and he should be familiar at least with the chemistry of the metals and minerals with which he has to deal.

In using the several appliances for crushing quartz and for saving the gold it is necessary to give attention to the character of the principal minerals and the metal as they occur in the Wynnaad. It is unlikely that, at least for some time to come, any other appliance than the bumble will be used in Southern India, but if the mines should be successfully worked there will no doubt be every attempt made to bring the machinery employed to a state as near perfection as possible. In the Wynnaad, in the many futile attempts made to treat the auriferous stone, it was the practice to roast the quartz before sending it to the mill. Where the proportion of gold in the stone is large, and if sulphides are absent, it is not injudicious to calcine the quartz previous to crushing; the quartz is made friable, and a greater quantity can be crushed per day, but if sulphides are present calcining is injurious. The effect of calcining when pyrites are present is to cause a glazing of the particles of gold in such a way as to make amalgamation with mercury impossible. The pyritic material can never be thoroughly oxidised in a kiln; a lower sulphide is formed which coats the particles of gold. The slags seen at the works in the Wynnaad, when examined under a lens, show why the yields were so far below what might have been anticipated from the appearance of the free gold in the quartz before it was sent to the stampers. The price of unskilled labour in Southern India is low, and it might be advisable in working some reefs to have the heaps of stone when broken picked, and all the non-pyritic material sent to a kiln to be roasted if by assay such material showed a yield sufficient to make the treatment of it profitable. It is now known that gold in the Wynnaad is usually most plentiful in the parts of the reefs which contain pyrites, and therefore the methods of extracting gold commonly adopted in Australia are most likely to give good results.

With regard to the employment of Chinamen in India, Mr. Smyth remarks that they are easily managed by Europeans, but they might not behave well in the midst of a mixed population like that of the Wynnaad. In considering in what manner the quartz veins of the Wynnaad and those in Southern India generally may be mined most advantageously, and in what manner the auriferous quartz should be treated, one turns naturally for information to the records relating to the large operations in Australia, where experience gained during the past 20 years, appliances perfected by engineers ever on the watch for improvements, and methods of treatment suggested by the experiments of chemists in the laboratory, leave but little to be desired as regards the economical extraction on a large scale of gold from its matrix. From what has been already stated, it is clear that in various parts of Southern India—and certainly in the Wynnaad—there are reefs which ought to give profitable returns to the capitalist if the same skill in mining and the same appliances for extracting gold were brought to bear on the operations as are at this moment indispensable to success in the largest gold producing countries in the world. Now that the old theories respecting the modes of occurrence of gold are no longer accepted even by the ignorant—now that it has been proved that quartz reefs are productive at greater depths than to which the miner can penetrate by vertical shafts, and that in the latter rich veins have been cut more than 2000 ft. from the surface, and quite 1300 ft. below the level of the sea, the miner is encouraged to undertake works which a few years ago would have been regarded as reckless enterprises.

It is obvious, says Mr. Smyth, that in this part of the world no such prospecting as that which has resulted in the discovery of rich reefs in Australia and California can be expected, even if the gold mines were proved to be richer than those of the countries named. The people generally have occupations which they would be loath to leave for what might be an uncertainty, and it is more than doubtful if their means—their ability to maintain themselves for such periods as

they would have to do unproductive work—would permit of their following gold mining as a pursuit in the same manner as it was followed a quarter of a century ago in Australia and America. Hence it will happen that discoveries of rich veins here will, probably, be relatively few as compared with the number of the reefs, and made only at long intervals. The excavations and pits of the native miners—works prosecuted in times past, and now nearly everywhere abandoned—are, however, often sure guides to the reefs in which gold occurs. It may be truly said that the veins now known to be highly auriferous have been discovered by tracing the old workings on or to the outcrops. The facilities for mining these auriferous reefs, as already stated, are very great; the reefs in most places appear at the surface either on the summits or on the slopes of the ranges, and the contours of the hills are such as to admit of horizontal shafts being driven so as to intersect the reefs. All the costs of winding, pumping water, and the maintenance of machinery, with the expenses of fuel and management attendant thereon, are thus avoided. The difference in the price per ton of getting quartz under such favourable circumstances as those described and in other places where vertical shafts are required to work the veins is very great.

With regard to the reefs themselves, Mr. Smyth gives much interesting and detailed information. As to the Glenrock, he states that there are three outcrops of quartz on the estate, and native workings of great extent. The rocks on the summit of Chic Hadiabeta are gneissoid, and in places somewhat granitoid. Masses are found to contain a pretty large proportion of magnetic iron, similar to the formation lying to the east and north. The vein quartz is milk-white, with pellucid grains of quartz scattered through it, and no pyrites were found in the place where the quartz was broken out. The summit of Chic Hadiabeta is honeycombed with shafts, most of them resembling those found on the Elizabeth estate—vertical for a few feet, with a sloping adit therefrom. On the north-western and western face of the hill the pits and adits are numerous; indeed, the appearance of these old excavations is striking, and the large amount of work done leaves no room for doubt as to the value of the reef and veins. The workings are continuous from the summit of the hill to a swamp where it is said Korumbars in former times used to sink shafts. The water interfered much with their operations, but it did not prevent them from getting out auriferous pyrites, which, according to the statements made, they carried to their homes and treated for gold. The proprietor of the Glenrock estate got very fine samples of heavy gold in the water-course which intersects this swamp. Hadiabeta and the neighbouring hills are scored with the now indistinct lines of old channels in which the miners in former times had conveyed water to their workings, and from these and the number of excavations, as well as the area which they cover, one can judge how attractive this field must have been in past times. The workings, indeed, may be said to extend from Hadiabeta to Parcerry Hill, and the reef at the latter is probably one of the same series which has been so largely mined at Glenrock. The formation of the country in this locality, except that the hills are loftier, is similar to that generally observed in this tract, and the facilities for carrying on extensive mining operations are very great. There is, perhaps, no part of the Wynnaad where there is a surer prospect of developing prosperous mines than here, and a very small expenditure of labour would suffice to ascertain accurately the extent and the value of the reefs.

South of the road from Cherambadi to Devila, and about three miles west of Cherambadi, and more than two miles north-west of Hadiabeta south Peak, there is a hill known as Yellemullay or Parcherry Hill. On a lower hill, a little to the south-west of Parcherry, there is an outcrop of quartz, or perhaps, to speak more correctly, a series of outcrops, some representing the main body of the veins, and others strong leaders therefrom. At this point the reef has all the appearance of an irregular mass of quartz, and where it is possible to observe the dip and strike there is much uncertainty concerning them, as they are often no more than the boundary lines of lenticular and wedge-shaped masses of country rock. Moreover, the whole of the hill is honeycombed with shafts and adits, and great blocks of the reef, with the surrounding country rock, have sunk down bodily, almost completely closing the adits and shafts. It was extremely difficult to examine any portion of these, owing to the falls of rock which have taken place since the workings were in progress. It was not possible to ascertain the total thickness of the reef where it was partly exposed in a large excavation, but it is undoubtedly very great. The quartz is everywhere full of soft iron pyrites and limonite and hematite, and on breaking some of the blocks large cavities were found nearly full of sulphur. On the Naiken Shola and Little Windsor estate there are at least 15 outcrops of quartz. About 25 chains from the Cherambadi bazaar an outcrop of quartz is seen on the main district road, and in the swamp on the south, not more than 5 chains distant from the outcrop, gold was got by washing the earth. Gold has since been found by Capt. Cox in the reef itself.

The Bazaar reef is clearly traceable for a distance of 50 chains south-easterly from a cattle-shed near the bazaar, and about 7 chains from the bungalow gold was washed off the soil. The reef again appeared 60 chains south-east of this point in the jungle, and it may be assumed that it has a bearing of north 36° west. Near a stream where the manilla plant is growing luxuriantly there are large masses of quartz, indicating an outcrop. Some washing was done here, but no gold was seen. About 20 chains east of this stream another reef was found, highly pyritic and promising well, but no gold was seen in it. There are three outcrops in this place.

Between Cherambadi and Moopenad 18 separate outcrops of quartz were observed. Many of these reefs are several feet in thickness, and they throw off leaders which penetrate the country rock in all directions, but principally appearing as nearly horizontal veins and strings. On the Moopenad estate there are great masses of quartz appearing at the surface on the banks of a stream east of the bungalow. The quartz, which is micaceous and granitoid in character, more resembles quartz rock than vein quartz. In other places there are well marked veins, greatly contrasting the more massive quartz which occurs generally. At Vellirymulla the hills are sharper in outline than at Cherambadi or Devila, and they are well clad with vegetation. Fragments of quartz are seen nearly everywhere. On the slope of a hill towards a swampy flat, and not very far from the river, Mr. Smyth was shown some pieces of quartz with gold visible in them—really good specimens—lying on the ground. He gathered all of these that he could see, and then sought for more, but no quartz similar in character to those showing gold was to be found. He then caused earth to be taken from the spot where the specimens had been lying, and had it washed, and not a particle of gold was to be discovered. Every care was taken to ascertain the facts connected with this rather remarkable occurrence of rich specimens lying exposed on a path daily trodden by persons employed on the estate, but nothing further was elicited than the fact that the specimens bore a great resemblance to those to be found at Wright's Level, near Devila. On the Munniy Poya, where it intersects a swampy flat near the pulping-house, there is a large outcrop of quartz, and numerous small leaders are thrown off from it. The quartz is in part ferruginous and laminated. Several dishes of earth were washed here, and gold was found in all but one. The entire district reported upon appears to have been very carefully and thoroughly prospected by Mr. Smyth, and the general result cannot but be regarded as satisfactory. The gold obtained in the Wynnaad is unequal in fineness—that from the soils being of the best quality. It has been observed in other countries that the finer the particles of the gold procured from alluvial deposits the higher is the quality. The Wynnaad Prospecting Company stated to him that they were able to break out quartz and deliver it at the kiln for Rs. 1-3-2 per ton, and now that nitro-glycerine compounds for blasting have been greatly improved, and made as safe as it is, perhaps, possible to make them, there is no reason why, in quarrying the large bodies of quartz that appear at the surface in so many places in the Wynnaad, the cost per ton should much exceed that paid by the Public Works Department for quarrying hard country rock. From information afforded by the Executive Engineer, Nilgiris, it appears that a native labourer, working eight hours per diem, can in ordinary cases quarry about 1½ cubic yard of solid rock per diem, and his pay is 6 annas per diem—that is to say, the cost of quarrying is 4 annas per cubic yard. The same authority

gives the price of excavating earth by native labour at 2 annas per cubic yard. By making adits or sinking shafts, and using dynamite, rock can be quarried, it is said in reports lately received, at the rate of nearly 140 tons for every pound weight of lithofracteur exploded. The consideration of these facts leads to the conclusion that while it is possible quartz mining, with such rude machinery and crude treatment as were common some 12 or 15 years ago, might have yielded profits in some places in Southern India, the reefs generally could not have been worked remuneratively. But the conditions are now changed, and it is beyond doubt that the old gold mines of Western and Southern Asia and Eastern and Southern Europe will sooner or later be re-opened by Europeans, who will provide themselves with all those appliances which have been brought almost to perfection by mining managers in Australia and California.

Lectures on Practical Mining in Germany.

CLAUSTHAL MINING SCHOOL NOTES*—No. CXLX.

BY J. CLARK JEFFERSON, A.R.S.M., W.H. SC.,

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Marsh gas is colourless, odourless, and tasteless, and but slightly soluble in water; 1000 cubic feet weigh 45 4 lbs., so that its specific gravity is 0.56; hence it is only about half the weight of air. On account of its lightness it tends to rise and fill upper workings, that have no outlet; it collects in cavities in the roof, but only so long as it is not caused to mix with the air by diffusion, or other mechanical means. When once diffused in the air it does not afterwards tend to separate. Many practical miners assert that they can smell fire-damp; as the gas is odourless this cannot be the case. Others aver that when it is present, or when one moves against a stream of air containing this gas, a sensation is experienced in the eyes like that from touching spiders' webs, and forms like white threads or a mist are noticed: this is probably a delusion. It is inflammable, burning with a blueish flame, and yellow tip; it is a non-supporter of combustion and of life, though it does not act as a direct poison, for if mixed with only twice its quantity of air it is quite breathable, and mixed with a large quantity of air may be breathed for an indefinite length of time, without any deleterious effects being produced. According to observations made by Davey, soon after his discovery of the safety lamp, when such a lamp is introduced into an explosive atmosphere of fire-damp the flame is seen gradually to enlarge as the proportion of carburetted hydrogen increases, until at length the flame fills the entire gauze cylinder. Should the amount of gas be very great the flame is extinguished. The existence of carburetted hydrogen is first visible in the flame of the lamp when the proportion of this gas in the atmosphere amounts to 1-30th, the flame increases until the proportion amounts to 1-15th; when the proportion, however increases to 1-14th the flame does not remain burning round the wick only, but is slowly propagated throughout the entire mass, when the proportion increases to 1-13th the first slight detonation takes place; when the proportion increases to about 1-10th or 1-9th the most violent detonation takes place; if the proportion of gas be further increased the violence of the explosion becomes less, until when it amounts to 1-5th the explosion is comparatively very slight, and between that proportion and a mixture containing equal quantities of marsh gas and air the mixture simply burns with a bright clear blue flame, within which the oil flame cannot readily be distinguished. When the proportion becomes greater than one-half the lamps are extinguished owing to a deficiency of oxygen. According to Pfahler, in a mixture of one volume of carburetted hydrogen and 30 volumes of air, the flame of the lamp is somewhat drawn out and sharply pointed, but there is not as yet any danger for the miner; in a mixture of one volume and 15 volumes of air the flame is still more drawn out, and the mixture begins to burn with a pale blue flame; in a mixture of one volume and 12 volumes of air the first slight explosion takes place within the gauze cylinder; with a mixture of one volume and 8 to 12 volumes of air the most violent and dangerous explosions; with one volume to 5 or 6 volumes of air the explosion is comparatively slight; with one volume to three of air no explosion can take place; and with equal volumes of carburetted hydrogen and air the mixture will just burn; when carburetted hydrogen is present in greater proportion than the air lights are extinguished, owing to a deficiency of oxygen, and death ensues from the same cause if the miner remains for any length of time in such an atmosphere, although with the previous proportions a stay for a longer or a shorter period is possible.

The above proportions are not applicable to all cases, since the fire-damp is seldom composed of pure light carburetted hydrogen; carbonic acid renders the mixture less explosive, and with a proportion of 14 per cent. of this gas the mixture becomes inexplosive. If the proportion of light carburetted hydrogen is below that necessary to use up the whole of the oxygen in the air, but the light carburetted hydrogen mixed with free hydrogen, of which a small percentage is nearly always present, the explosion will be more violent than if light carburetted hydrogen alone was mixed with the air. That the violence of an explosion and the temperature at which it occurs are both affected by the presence of other gases besides light carburetted hydrogen is a fact which should be considered when experiments on safety-lamps are made with ordinary street gas. The latter contains roughly 20 per cent. of hydrogen, 10 per cent. of heavy and 60 per cent. of light carburetted hydrogen, and 10 per cent. of carbonic oxide, and therefore explodes more violently and at a lower temperature than pit gas, when mixed with a proper proportion of air.

The temperature required for the combustion of different gases varies greatly. A high temperature is required for the existence of flame, and particularly of flames produced from the combustion of hydrocarbons; light carburetted hydrogen requires a higher temperature to ignite it than other hydrocarbons. A red hot glowing piece of iron, or a piece of glowing coal, will not ignite a mixture of air and light carburetted hydrogen, but when the temperature rises to a white heat the mixture will be at once ignited. A temperature of between 1000° and 1500° Fahr. is required for the ignition of a mixture of pure light carburetted hydrogen and air; the presence of other hydrocarbons tends to lower the temperature required for ignition.

The products of the combustion (explosion) of fire-damp are carbonic acid and steam, so that the gases which fill the levels and the workings of a mine after an explosion are carbonic acid, nitrogen, and aqueous vapour, supposing the combustion to have been complete, and that there has been just the proper quantity of air to effect the combustion. One volume of light carburetted hydrogen consists of a half volume of carbon and two volumes of hydrogen, and requires for complete combustion two volumes of oxygen, or chemically expressed— $CH_4 + 2O_2 = 2H_2O + CO_2$, and produce two volumes of steam and one volume of carbonic acid. As air contains, roughly speaking, one-fifth of its volume of oxygen, we should require for the complete combustion of one volume of fire-damp ten of air, and should have as the result of the combustion eight volumes of steam, one volume of carbonic acid, and two volumes of steam. We have, therefore, theoretically as that proportion giving the most violent explosion a mixture of ten parts of air to one part of light carburetted hydrogen, which agrees with what we have above stated. In consequence of the high temperature developed by the combustion, the gases produced occupy a much larger volume than before the explosion, and it is this dilatation which is the cause of the frightful blast which sweeps everything before it; tearing down the doors, posts, bracings, smashing corves, guides, conductors, and sometimes not sparing even the head gear of the pit bank.

If we take the temperature developed by the explosion at 1350° centigrade (a white heat), and the co-efficient of linear dilatation as .0036, or 1 273 per degree centigrade, and consequently that of cubic dilatation at three times that amount, we have as the increase

in volume of the resulting atmosphere 15 times the volume at the ordinary temperature. We have taken 1350° centigrade as the temperature of the whole atmosphere (including the inert nitrogen), and consequently the resulting volume after the explosion as 16 times that before the explosion. We are not, however, strictly correct in saying that the volume is 16 times as great, for it must drive back the in explosive atmosphere on all sides to make room for this increase in volume. Again, before the resulting gases can have expanded so as to fill this volume they begin to cool, the steam is condensed to water, and the carbonic acid and nitrogen begin to cool and contract in volume, so that when they have cooled down to the ordinary temperature of the mine the nitrogen, carbonic acid, and water really occupy less volume than before the explosion. The resulting gases, therefore although they expand rapidly directly on the explosion taking place, do not expand so many volumes as might at first be supposed; but in the instant of explosion, before the gases expand, a pressure of 15 atmospheres is suddenly produced. When a mixture of marsh gas and oxygen is exploded the pressure is 37 atmospheres, or 560 lbs. to the square inch. The explosion of a mixture of marsh gas with air is much less violent, owing to the presence of 4 1/2 of the volume as inert nitrogen, so that the resulting pressure is about 15 atmospheres, or 210 lbs., to the square inch in the immediate neighbourhood of the explosion. If we suppose the case of a door or stopping in the immediate neighbourhood of the explosion, whose section is 4 ft. by 5 ft., we have as the pressure suddenly brought to bear upon the door 280 tons, or, taking the surface offered to the blast by a miner in one of the roadways immediately in the neighbourhood of the explosion as 5 square feet, he would be caught by the blast with a force of 70 tons. These figures, although relating to the extreme case where the air and gas are mixed in the most explosive proportion, and for the immediate neighbourhood of the explosion, will still give one some idea of the immense force of the blast resulting from an explosion, so that it is not surprising to hear or read of the roof of roadways or levels being blown down as if with powder or dynamite.

It very rarely happens that the air and gas are mixed in the above proportion of 10 to 1, or that the mixture which explodes is uniform throughout, hence the varying effects and phenomena attending an explosion. Many miners who have been in explosions state that the gas takes fire and often burns, the flame sometimes advancing and retreating out from and to the goaf where the gas may be collected some few seconds before the explosion or blast takes place, and that sometimes before and always soon after a blast a "suck" of air takes place toward the spot where the explosion has occurred. It would appear as if in the lower portion of the mixture of air and gas that the proportion of gas is under 1-12th, so that the gas burns without the ignition being instantaneously transmitted through the whole of the mixture, but directly that portion of the mixture which is explosive is reached the explosion and blast are instantly determined. Or, on the other hand, the proportion of gas to air in the goaf might be above 1 in 5, so that the gas only burns when it is in contact with the air, but owing to the convection currents immediately set up, a rapid mixing of air and gas takes place, until when the proportion of air to gas is increased much above 6 to 1 the explosion or blast follows.

Again, it appears most unlikely to expect that in different portions of the mine in which the fire-damp occurs, or rather that in any explosive mixture of air and gas, the mixture is homogeneous. In the above supposition we have considered the case of a goaf where the variation in composition of the explosive mixture is supposed to vary in a vertical direction; but it is also evident that there will be variations in a lateral direction, and hence under this consideration one may expect varying phenomena in the explosion, according to the portion of the mixture which is first ignited. Where the mixture is ignited first in the most explosive portion one may expect that the blast will disperse other portions of the mixture which will burn slowly, and make it very improbable that after the explosion or blast any portion of the mixture may remain burning, and hence that there will be little danger of a second explosion. If the blast is comparatively weak, or the mixture has been ignited at a part where it burns for some time before the blast occurs, there is great probability that the coal or woodwork may have been set on fire, and should the gas continue to come off after the first explosion a second and third may readily take place.

The temperature of the gases falls very quickly after the explosion, so that a contraction succeeds the previous dilatation, and this contraction is increased from the fact that the aqueous vapour condenses to water, in which form it occupies only about the 1-2000th of the volume of its constituent gases before the explosion; this contraction is the cause of the "sucking in" of air down a pit-shaft after an explosion.

Of the gases resulting from an explosion carbonic acid acts as a direct poison; nitrogen is irrespirable without the presence of a sufficient quantity of oxygen, and the aqueous vapour being immediately afterwards converted into water affords nothing for the miner to breathe. From this it is at once apparent what little chance there is for those who have escaped being burnt or blown to pieces by the force of the blast. Even if we take the mixture which is just explosive, and contains the largest proportion of air by which an explosion can by any possibility take place (say one volume of gas, and fourteen of air), we have in the resulting atmosphere only four volumes of air, mixed with eight volumes of nitrogen, and one volume of carbonic acid—an atmosphere in which it is impossible for human life to exist.

Whenever the proportion of air is less than that theoretically required for the complete combustion of the fire-damp a considerable proportion of carbonic oxide is formed, and even when the proportion of air is sufficient for complete combustion it is probable that some small proportion of carbonic oxide is formed, owing to the combustion of a portion of the fine coal dust when enveloped in the flame of the explosion. (This will be referred to again when we come to speak of the occurrence of carbonic oxide in mines.)

THE DISCOVERER OF THE CALIFORNIAN GOLD MINES.—The American journal *Progress* mentions that Johann Sutter, in whose fields were discovered the first Californian gold mines, finds himself at the age of 79 in very indifferent circumstances. Sutter is now living in a Moravian colony in Pennsylvania. Though a Swiss by birth, he served till his 30th year in the French Army. In 1834 he settled in Missouri. After various migrations he came to California, where in 1849 he discovered the first gold mine.

MR. EDISON'S DISCOVERY.—Mr. Edison's latest discovery bids fair to eclipse any that he has yet made if the accounts given of it by the American papers prove correct. He has, it is stated, invented methods by which he can extract a greater amount of gold from the rejected residuum of auriferous quartz, termed by miners tailings, than is obtained by the present processes from the virgin rocks triturated by the crushing mills. The agents he employs are chemistry and electricity. He takes a quantity of tailings, which, so far as any known process is concerned, contain not a trace of gold, and produces therefrom the precious metal in quantities truly astonishing. He says that by his method he has got out gold from concentrated tailings at the enormous ratio in some instances of \$1400 per ton, at an expense not exceeding \$5 per ton. This discovery was made by him while endeavouring to find a supply of platinum for his electric lamp. In experiments made by him with a view of inventing a process for the cheap extraction of this metal from the

tailings of some California gold mines, specimens of which had been sent to him, he was surprised at the large amount of gold existing in the rejected residue of the mines. This gave his researches a new direction. The electric light came to be a secondary consideration. He devoted his energies to a fresh discovery, and the success of his process was at last evident beyond a doubt. Keeping the secret to himself and a few confidential agents, he at once made contracts for the tailings of a number of the largest mines for a term of years. He has thus secured millions of tons of tailings, and if his manipulations of the refuse really prove as valuable as stated, Mr. Edison ought to become a "veritable Cresus."

—*Pall Mall Gazette.*

FOREIGN MINING AND METALLURGY.

Business has been transacted with some difficulty in coal in Belgium. Prices are uncertain, and buyers have not been very numerous. It is scarcely possible to give any guiding or basis quotations, as prices show a wide range. In the Mons basin there has been no fall at present, but transactions have become comparatively rare. The Gossen-Lagasse Collieries Company realised a net profit of 14,238, in 1879, admitting of a dividend of 27. 16s. per share. The profits of the Sacre Madame Colliery Company in 1879 amounted to 13,446, out of which a dividend of 6 per cent. has been paid for the year. The average dividend paid upon this company's shares for the last five years has been 12 1/2 per cent. per annum.

Coal has not been very firmly supported in France, and the season has commenced under favourable auspices. The demand at Paris for household qualities of coal has become very limited. The Austrian coal trade has been maintained with firmness.

There has been no sensible modification in the state of the French iron trade. There cannot be said to have been any serious fall at present, and the works are still well occupied. Many of them have orders on hand which will carry them on to the autumn. Steelworks of some importance are about to be established near Montmedy, in the Meuse, between Ecouvion and Grand Verneuil. The land for these works has been already purchased. The state of the Austrian iron trade strongly resembles the condition of the Belgian. Little business has been done, and the few contracts concluded have been carried through upon lower terms. Much reliance had been placed upon the demand likely to arise from secondary railways, but these expectations have been disappointed. Business has been restricted in pig, and quiet for iron, plates and wire have been in less demand. The Bochum Company has obtained an order for 8000 tons of steel rails for the Upper Italy Railway at 97. 6s. per ton, delivered free at Genoa, and 97. 8s. 10d. per ton, delivered free at Venice. The same company has also obtained an order for 2000 tons of steel rails for the Roman Railway.

The Belgian iron trade has presented scarcely any new feature. The *status quo* is about maintained, but there is a marked tendency to feebleness. Iron is quoted at Brussels at 7l. 4s. per ton, but this price is to some extent nominal. The proprietors of blast furnaces are asking 3l. 12s. to 4l. per ton for their pig, but it has not inspired whether they have succeeded in doing business upon these terms. There are still a good many old orders in course of execution, and so long as they are not exhausted there will be no offers at lower rates; ironmasters consider naturally that it will be time enough to make such offers when work is exhausted. The same consideration presents itself as regards iron. About 7l. 4s. per ton is asked by certain works which are well occupied, but forges who have less to do—and they are a tolerably numerous class—are beginning to offer goods upon lower terms. A contract has been let this week for 2000 trucks required for the Belgian State lines; heavier axles and other improvements increased the price of these trucks about 8l. to 12l. each. Steel continues to be firmly held in Belgium, and is not affected by the general fall in prices.

LOCOMOTIVE BOILERS.—In reporting on the explosion of the boiler of an engine attached to a train of empty wagons on a mineral line at Silksworth Colliery, near Sunderland, on the North-Eastern Railway, Major-General Hutchinson says:—"During the past five years there have been altogether 15 explosions of the boilers of locomotive engines, of which no less than 9 have occurred on the North-Eastern Railway. This is a state of things which I submit deserves the very serious attention of the directors."

WHITE CORAL.—The *Indische Mercur* of this month calls attention to the use which might be made in Europe of the white coral abounding on the shores of the West Indian Islands. In the Bermudas, the Dutch-India journal, numerous houses are to be seen built of coral material, which is both solid and porous, even the quality of coral called "brain-stone," which alone is unventilating, might be utilised for doorsteps or sea dykes.

ENRICHMENT OF ORE.—An improved dry process for the enrichment and purification of ore has been invented by Mr. A. F. Gundersander, of Gammelstilla, Sweden. The ore, with its rock components, is reduced by means of suitable crushing machines (either with or without previous burning) to a powder of the degree of fineness required in each separate case. An even current of air (from a blast-engine, fan, or such like), the pressure of which is regulated according to circumstances, is fed with the powder perfectly dried, which is spread by the current in a room protected from other intervening currents of air, and which may be termed the "enriching" room. In this room the action of gravitation upon the powder thrown into the air causes the various components of the powder to divide in falling according to their respective specific weights, so that the heavier fall first, and the lighter further off. The powder is introduced through narrow fissure, so as to fall continuously in measured quantities into the current of air proceeding from the mouth of the tube. The powder may also be introduced through an inner tube inserted in the air pipe, in which case it is led into the air current by the exhaustion of the air in the inner tube. Movable partitions are fitted at the lower part of the enriching room. These partitions are fitted at different places for different ores. The part or parts of the divided components that are to be employed are removed through some of the apertures in the sides (or otherwise at the bottom), and the refuse is carried away through the other apertures. When only one kind of ore is to be treated the bottom may be provided with fixed cavities. Provided one or more injurious minerals, in consequence of equality in their specific weight, cannot in this manner be separated from the ore by gravitation, the mass must be treated by magnetism, calcination, or otherwise.

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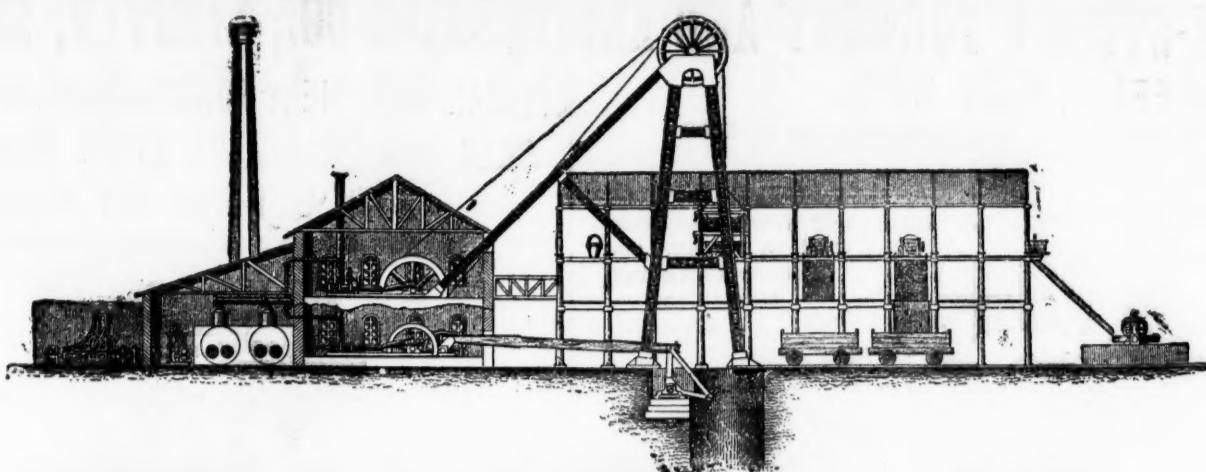
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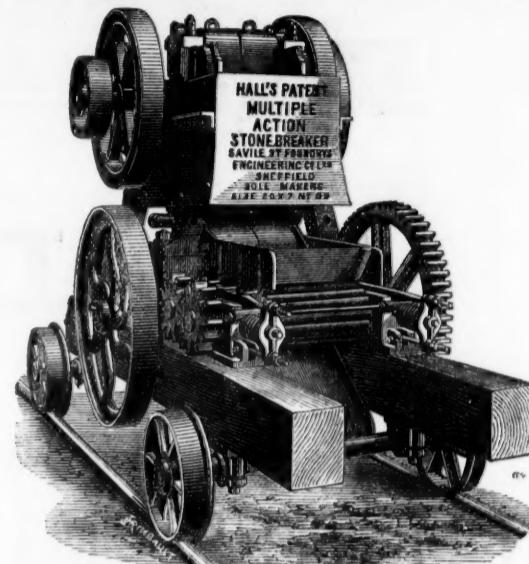
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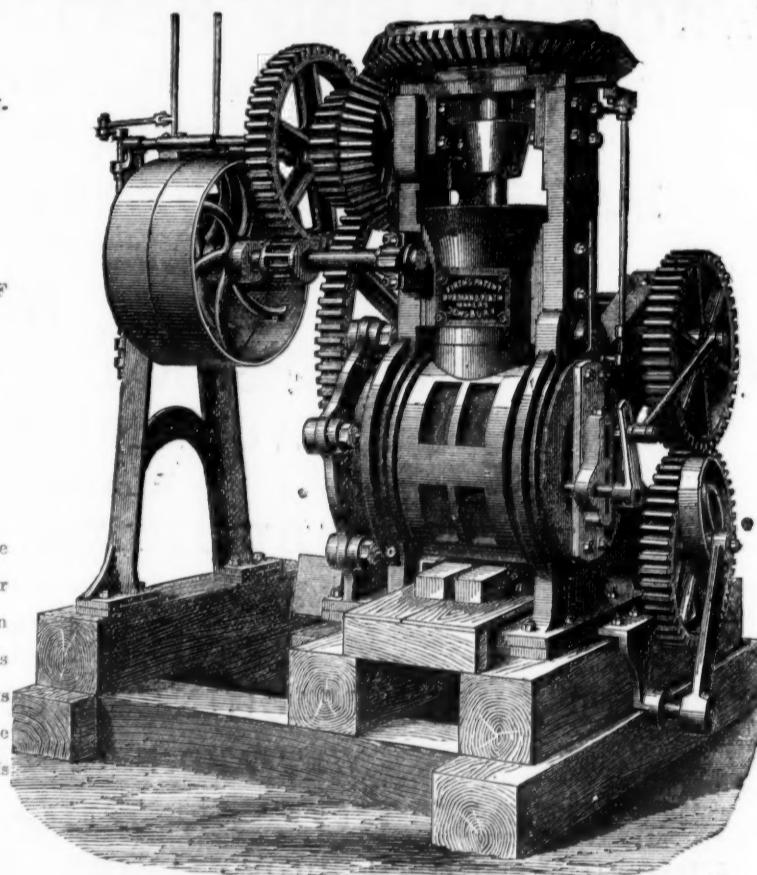
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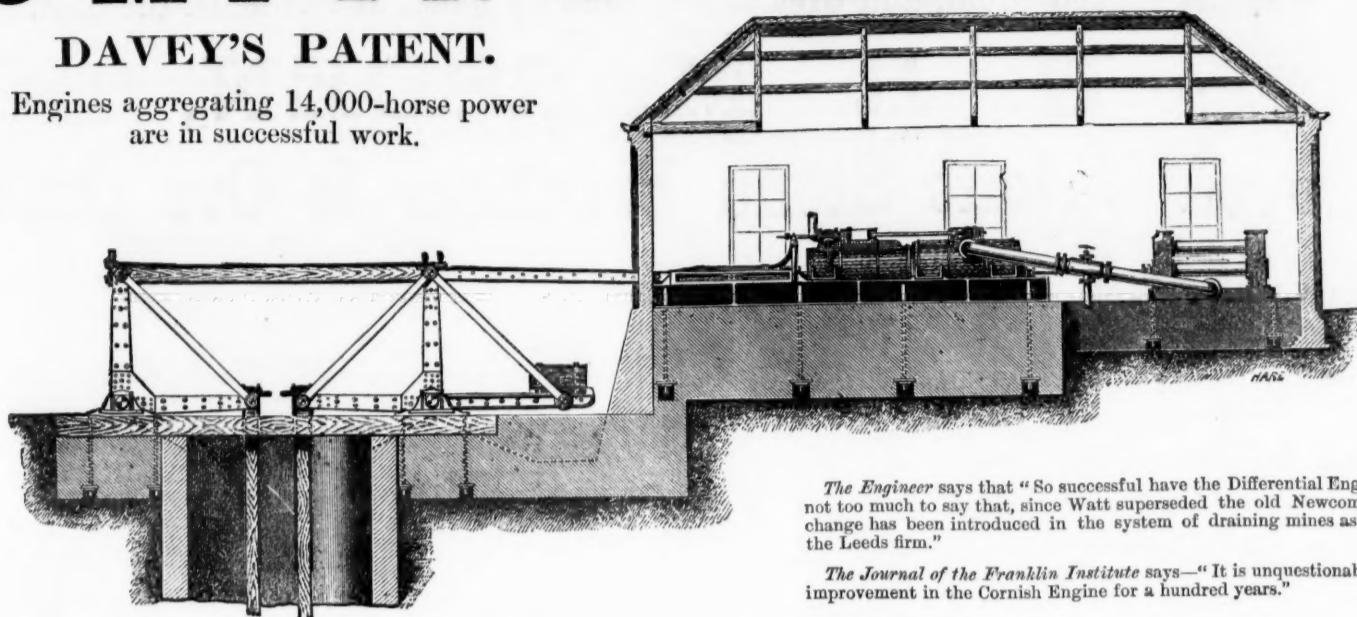
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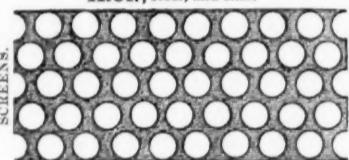
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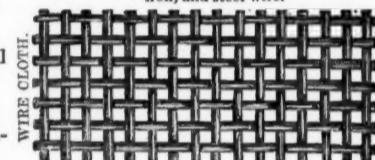
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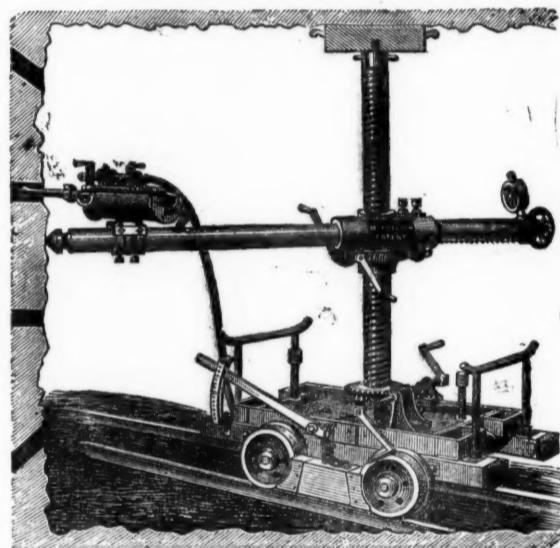
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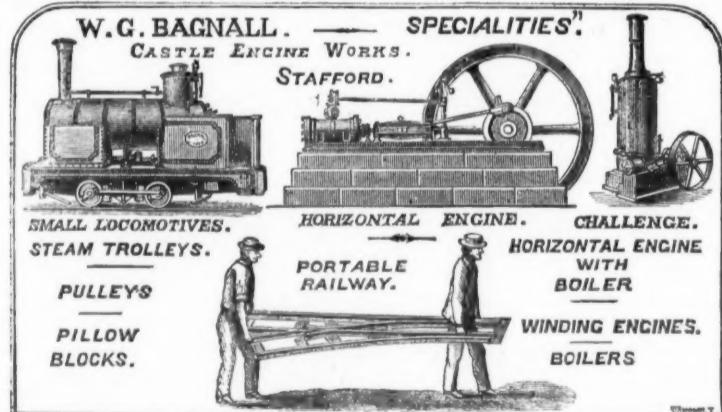
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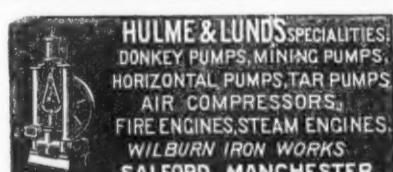
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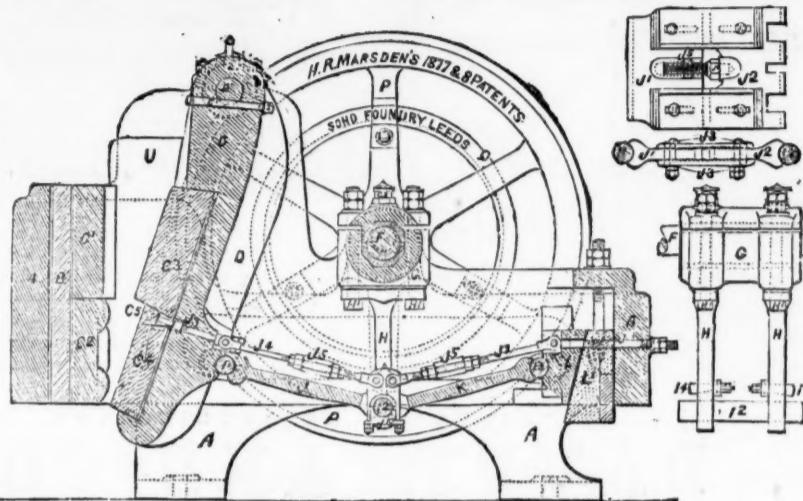
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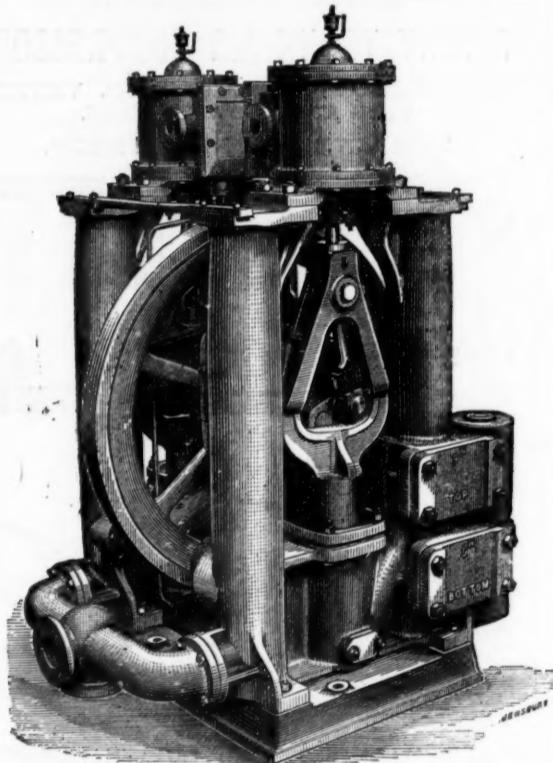


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